FIELD INSTRUCTIONS FOR THE
INVENTORY OF CALIFORNIA
1992-94

prepared by
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I. INTRODUCTION

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I. INTRODUCTION

This manual describes the procedures for field plot measurement used by the Inventory and Economics Program in the 1991-1994 inventory of California.

The Portland Inventory and Economics (I&E) Program of the Pacific Northwest Research Station (PNW), USDA Forest Service, is one of seven such work units across the United States. The PNW Inventory and Economics program at Portland is responsible for inventorying the forest resources of the Pacific Coast States.

A. Purposes of this manual. This manual serves two major purposes:

1. to instruct field personnel in how to locate and measure field plots in the 1991-1994 inventory of California.

2. to document the field procedures and codes used in the inventory. Documentation is needed by members of the Research Work Unit (RWU) and by the various "customers" of I&E data.

B. Organization of this manual. This manual is structured primarily for ease of use by field personnel. Each chapter corresponds either to a separate function that must be performed in locating and measuring a field plot, or to a unique section of data recording that must be completed. Information that is infrequently used or that is included here for documentation purposes is contained in the appendices at the end of this manual. In addition, a glossary is provided for quick reference.

C. The inventory of California.

1. Background. In California, I&E collects data on all lands outside National Forests and reserved areas. The State has been divided into six inventory units: North Coast, North Interior, Sacramento, Central Coast, San Joaquin, and Southern. The 1991-1994 inventory of California represents the third measurement of plots established by PNW. California plots were previously measured in 1965-1972 and in 1981-1984. Note: Throughout the manual the abbreviations "OCC 1", "OCC 2", and "OCC 3" will be used when referring to the three California inventories at Occasion 1, 2 and 3, respectively.

2. Objectives. I&E provides information needed by resource planners, policy analysts, and others involved in forest resource decision-making. The collected data are summarized, analyzed, interpreted, and published in statistical and analytical reports for the U.S., for California, and for the above six inventory units within California. Published data will include information on: forest land area; timber volume; forest growth; removals and mortality; potential forest productivity; opportunities for silvicultural treatment; kinds and amounts of wildlife habitat; forest ownership; and resource zones. I&E also provides data to answer additional questions about California's forest resources as they arise.

D. Overall Design. The California inventory design is a double sample for stratification similar to the one described by Cochran (1977, 327-335), but differing in that both the primary and secondary samples are arranged on permanent grids. The primary sample is laid out on a 1.37 k (.85 mile) grid that was established on base maps or orthophotos in l981 and transferred to aerial photos. At that time, the entire state was divided into 1.37 K squares and a grid point located randomly within each square.
The secondary or field plot grid is spaced at 5.47 k (3.4 mile) intervals, providing 1 field plot for every 16 primary points. Although the secondary grid was established in l981, about half of the plots are at locations established before 1981.

The primary sample--the photo grid--is used to stratify the field plots into groups that are similar in characteristics such as land class, timber volume, forest condition, and wildlife habitat. When done successfully, this stratification will reduce overall variance, resulting in more precise estimates of these statistics.

Although the primary grid is laid out across all ownerships, the actual inventory area excludes National Forest land, Census Water areas, and reserved lands--National and State parks, Nature Conservancy areas etc. In addition, large areas of continuous nonforest--the "nonforest zone"-- such as extensive agricultural and urban areas, are not sampled. Thus, the inventory area is the area of the State less the area in National Forests, reserved areas, nonforest zones, and Census Water areas.

D. Additional sources of documentation. More information on the procedures followed in the 1991-1994 inventory of California are available from the following documents, on file at the Research Work Unit in Portland, Oregon:

1. Field instructions for the inventory of California --1965/72, 1981-1984.

2. California PI manual for 1981-84.

3. California PI manual for 1991-94.

4. California inventory techniques manual and study plan.

6. Complete documentation for the inventory of California, 1991-1994.

XI. WRITING UP THE PLOT

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XI. WRITING UP THE PLOT

A. The Plot Record

1. Crew identification: Estimator--Recorder--Date--Husky ID#. Record each crew member's name, and the date the plot was completed. Also record the ID # of the Husky data recorder that was used on the plot.

2. Plot Layout/Map.

The 5 subplots will be diagrammed on the Plot Record. Number the subplots with the appropriate numbers.

Show any significant features (e.g. drainages, rock outcrops, other items that may help future crews relocate the plot).

Show all condition class boundaries (ground land classes, forest stand conditions) of the plot making sure that the layout on the Plot Record is consistent with the 17-meter subplot diagrams.

3. Recording the RP tree data.

Record the species, dbh (to the nearest cm), azimuth, and slope distance (to the nearest meter from RP to subplot 1) on the Plot Record.

In the "Location Description" section on the Plot Record, record any information that would facilitate relocating the plot. Describe the subplot 1 location in terms of features that are unlikely to change before the next remeasurement. Include such items as slope, aspect, topographic position, and prominent features. In short, record observations in a way that will be of the most help to the OCC 4 field crew in relocating subplot 1.

Example: "RP is a tall redwood (over 60 meters) in draw that leads north from improved logging road. It's directly uphill from a large tanoak on subplot N1."

If you used a point of departure (POD), describe how you reached the plot from the POD in the "Location Description". Explain your route in terms of azimuth traveled; whether you walked uphill, downhill, or on the contour; any recognizable physiographical features (e.g. streams, rock outcrops, benches) you passed along the way. If any new roads have been built in the area since the date of the OCC 3 photos, sketch them on the photos if it will help the OCC 4 field crew relocate the plot.

4. Present condition/Past disturbance. Provide general information about the plot area, such as: stand age, species composition, stand history (cutting and other disturbances such as fire, flooding, wind, mining, grazing, home-building, recreational development), stocking, understory, recommended treatments. Note anything unique or unusual about the area. In addition, discuss any questions regarding land class, site index questions, explanations for number of site trees taken and from what condition class they were taken, plot layout, disease or other impacts, harvest, silvicultural treatment (if the treatment occurs on less than all five subplots, note the point numbers, and describe the types).

In discussing any changes in how the plot area is classified (e.g. changes in land class, stand history, stand impacts, etc., that are due to a road, management activity, etc.), note whether the change is a real change since OCC 2, or a pre-existing condition that was misclassified at OCC 2. Also indicate the item in "Contact Office About".

Note if Occasion 1 pinprick was incorrect and repinpricked. Also note if fewer than 5 subplots were established.

Example: "Stand is near transition zone between redwood forests of the coast and drier, Douglas-fir dominated sites typical further inland. Undisturbed stand (except for fire approx. 90 years ago) consists of a redwood, Douglas-fir, tanoak, and scattered madrone overstory. Understory dominated by dense evergreen huckleberry. There are many recent windthrows present (mostly tanoak and madrone), probably from Oct. '81 windstorm. The many skid roads constructed in the area have created a runoff, and hence, erosion problem. The draw near N1 has gully erosion."

While some of this information is coded elsewhere on the data sheets, this narrative provides valuable additional information that can enable an analyst to better understand the plot.

5. Field Check Item: This is an office entered item to alert the field crew for any classification questions, information needs, or any specific requirements for collecting information from the plot. The plot reviewer may include the following information:

Instructions of site trees.
Subplot numbering.
Special owner instructions.
Ecological unit for plant indicators of new subplots or if a different condition class on the plot may warrant collecting two lists of plant indicators.

6. Contact Office About: This is a field entered item. Make note of any items you feel should be reviewed or resolved by the field coordinator or by office personnel before the plot is processed. Record any of the following:

Fewer than 5 subplots classified or visited.
Sample kind of condition class 1 is different than the office assigned sample kind.
Condition class 1 has changed from OCC 2 to OCC 3
Specific data requests from owners.
Husky data recorder entry problems and illogical data checks.

7. Owner Response: This is an office entered item to inform the field crew of the status of landowner contact for the plot. All miscellaneous private owners were sent a letter before the field season. If the landowner has responded to the letter by returning the post card "(YES) card enclosed" will be circled. If it is unknown whether contact has been established, "(NO) need to check owner list" will be circled.

All forest industry and corporate ownerships are contacted by telephone before the field season, and a list of responses is compiled (e.g. name and phone # of person to contact when we are in the area, or A-O.K.--all roads clear).

The field coordinator will contact all industrial landowners at each new field location (as per instructions on the response list) and indicate on the plot jacket, or in other additional information under Interactive Items, what the conditions of plot access are for the field crew.

8. Does Current Owner Class differ from OCC 2 Owner Class? This is a field-entered item that is used in updating owner class on the data file. Write "YES" if there is clear evidence (i.e. surveyed boundary markers, conversation with owner, or courthouse records) that indicates subplot 1 center falls in an ownership that is different from the downloaded/printed class. Refer to owner class codes on page 79 since owners may change but owner class may remain the same. Note the source of information and the updated owner class in the space provided. Also record the date of change if it is known under "If Yes, Date of Change. Update the owner list (provided by field coordinator).

9. Is Date of Disturbance since OCC 2 confirmed? If the date of any disturbance on the land since OCC 2 is confirmed write "YES". "Disturbance" is defined in Item 16 on the Plot Attribute Record, it means any harvesting activity or wildfire. Make sure this is consistent with the date of disturbance since OCC 2 Item 18 on the Plot Attribute Record.

10. Remeasured Plots Only: Condition Class 1 OC2 GLC Updated? This is a field-entered item that is used in updating OCC2 Ground Land Class on the plot file. Type "YES" if you disagree with the OCC2 GLC classification of condition class 1 and note the reason under "If Yes, Explain".

B. Subplot Diagrams.

1. Fill out County and Plot number on the 17-meter subplot diagrams.

2. Number each subplot diagram.

3. If there are condition class boundaries, make sure to map them and use the Azimuth and Distance spaces in accordance with instructions on page 129 under "Mapping Condition Class Boundaries."

4. Map, code and record percentages of root diseases.

5. Map, explain and record percentages of nonstockable areas.

C. The Plot Jacket

1. Crew. List the names of the crew.

2. Date Completed. Write the Day-Month-Year the plot was fully written up and handed into the supervisor.

3. Check Plot? Date?. If the plot was check plotted, write initials of check plotter and the date of the check plot.

4. Crew Sup. Edit By/Date: The crew supervisor will initial and date when the plot has been field edited.

5. Hard Copies Enclosed? Write "YES" if a computer print out of the plot is enclosed.

6. Owner Request for Information? Write "YES" if an owner has requested any information about the plot. If "Yes", write the owner's name and address on the label on the plot jacket and the nature of the information requested.

X. COARSE WOODY DEBRIS

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X. COARSE WOODY DEBRIS

A. Introduction. Coarse woody debris (CWD) is dead, downed pieces of wood. In the California inventory, we are sampling pieces of CWD that are at least 1 meter in length and at least 12.5 cm in diameter at the small-end. CWD, like live trees, shrubs ,herbs, snags and stumps, is a component of a forest's structural diversity and biomass. In recent years, CWD has received increasing attention from wildlife biologists, mycologists, ecologists, and others interested in forest relationships. These researchers are interested in CWD because it relates to:

1. wildlife habitats,
2. forest diversity,
3. storage and cycling of nutrients and water, and
4. carbon sequestration, which relates to atmospheric conditions.

Knowledge about the structure and function of CWD debris is incomplete. Most studies have been conducted in mature and old-growth forests that originated naturally after wildfire. Little is known about the characteristics of woody debris in managed stands and in stands that originated after logging--stands which increasingly predominate within the forest lands that IE inventories in the Pacific Coast states. Data on CWD collected on field plots in California will be used to address these information needs.

B. Definition. In this inventory, CWD includes dead tree boles, limbs, and other woody pieces that have been severed from their original source of growth or uprooted. CWD includes uprooted tree and shrub boles and any stems or branches attached to them. CWD does not include:

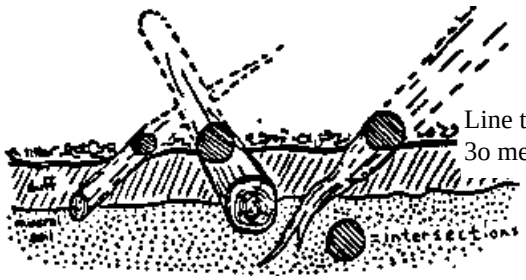
(1) Standing trees, stumps, or shrubs.

(2) Dead foliage, bark, or other non-woody pieces that are not an integral part of a bole or limb. (Bark attached to a portion of a piece is an intergral part).

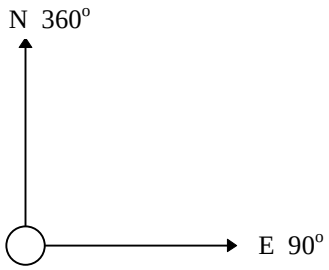
(3) Roots or main bole below the root collar.

C. When to collect data on coarse woody debris. Collect data on CWD on all subplots where the subplot center is in timberland, low productivity forest or oak-woodland on the 11k grid. On subplots which sample more than one condition class, collect CWD only within the condition sampled by the subplot center. Truncate the transect at the point where it intersects a condition class boundary.

D. The line transect method. CWD that is not in piles created by direct human activity, is sampled using the line transect method (also called the line intersect method). In this method line transects are established, and downed pieces meeting specified dimensions and conditions are tallied if their central axis is intersected by the line transect. Instructions for tallying piles created by direct human activity are on page 237.



E. Locating and establishing line transects. Establish two 17-meter line transects to sample CWD on each established subplot. Each 17-meter transect originates at the subplot center. The azimuths from subplot center to the end of the two lines are, respectively, 360 (0), and 90 degrees. The 17-meter distance is horizontal distance.



On subplots where a transect intersects a recognized boundary change, the transect is terminated at this boundary, as CWD is tallied for the condition class of the subplot center only.

Use the procedures below to identify woody material that qualifies for tally along the sample plane.

F. Tally rules for coarse woody debris. Tally pieces of CWD that intersect the line and meet the following criteria:

(1) Tally a piece only if it is at least 12.5 cm in diameter at the point of intersection with the transect plane.

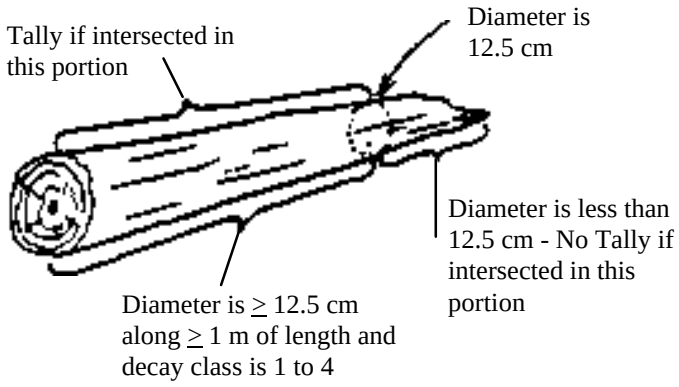
(2) Tally a piece only if it is at least 1 meter in length and 12.5 cm or more in diameter along that length.

(3) Do not record pieces that are part of a slash pile or windrow. Instead, tally the pile according to instructions on "Sampling Piles and Windrows." A slash pile or windrow consists of broken logs, limbs, and other forest debris that is machine piled during logging or site preparation operations. Do record CWD that is unmerchantable poles and tops that were created during felling and bucking, if not systematically machine piled.

(4) Tally a piece only if the sampled portion is in decay class 1, 2, 3, or 4. Do not tally the piece if the sampled portion is in decay class 5. Pieces in decay class 5 are not tallied because of the difficulty in defining logs of this category--the entire ground surface in some forests seems to be decay class 5 material--and the subjectivity in measuring them.

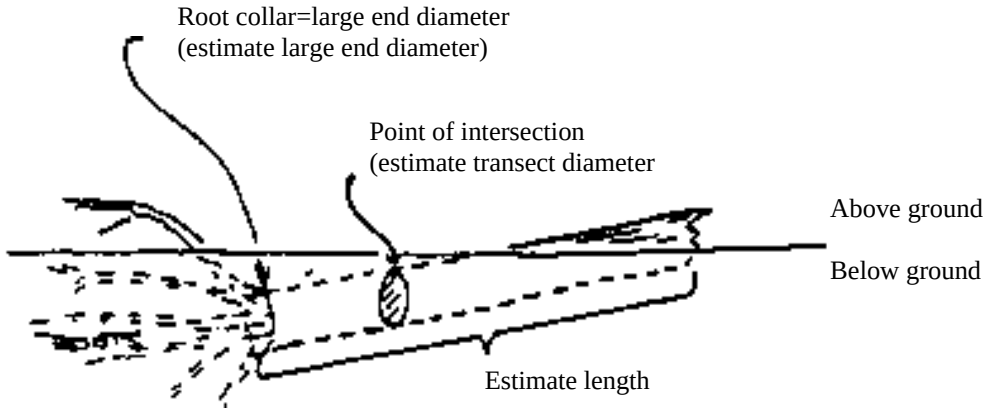
Do not kick apart or chop pieces to determine their decay class. Determine if a piece is in decay class 5 by probing it with a metal plot pin; if the pin does not penetrate through the center of the piece, it is in decay class 1 through 4, and not 5.

A piece can include one or more decay classes that differ from the decay class at the point of intersection.



(5) Tally a piece only if its central longitudinal axis is intersected by the transect plane. The piece may be on the ground or suspensed above ground at the point of intersect or elsewhere along the bole.

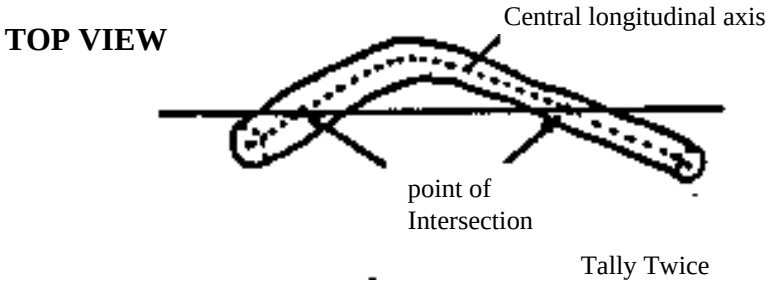
(6) Tally a piece regardless of whether the point of intersect occurs above ground or is buried--by natural or man-caused disturbance--in the litter, duff or mineral soil. The only restrictions on tallying buried pieces are (1) that the piece is visible somewhere above ground and (2) that it is estimated to meet the other criteria for tally.



(7) If the central axis of the piece is intersected more than once, tally it each time it is intersected.

(8) Tally a piece only once if the subplot center falls directly on the piece of CWD. Tally the piece on the north transect.

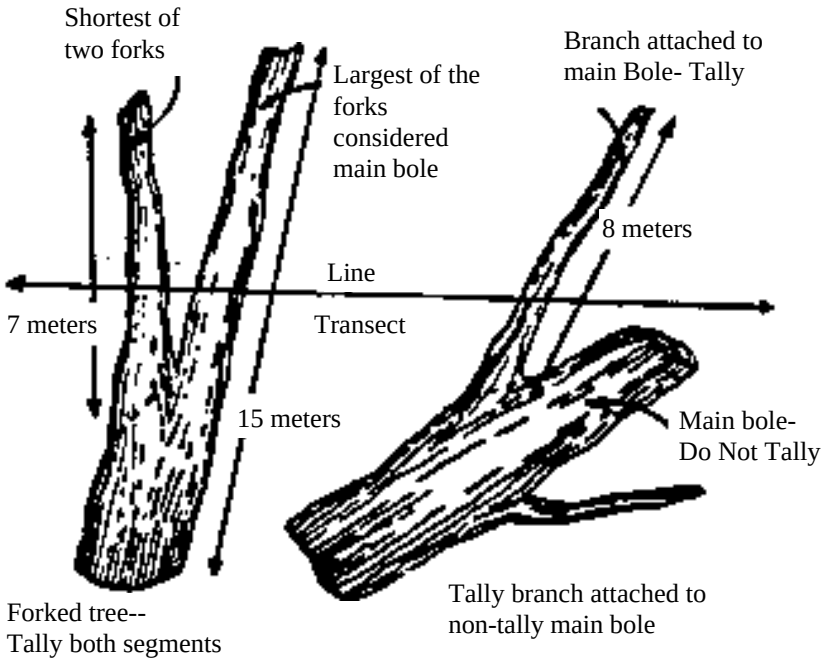
(9) If a log is fractured across its diameter, and would pull apart at the fracture if pulled from either end, treat the log as two separate pieces. Tally only the piece intersected by the transect. If judged that it would not pull apart, tally the log as one piece.



(10) Do not tally trees, snags or stumps that are leaning, but still supported by roots from falling over. Tally uprooted trees, snags and stumps that are no longer supported by roots.

(11) Do not tally a piece if the transect intersects the piece on the root side of the root collar. Do not tally roots.

(12) When the transect crosses forks or branches of one tree (i.e. two or more pieces that are connected), tally each qualifying piece separately. (Each individual piece must meet the minimum diameter and length requirements in order to be tallied.) In the case of forked trees, consider the largest of the two or more forks as the "main bole;" characteristics for this fork, such as length, should pertain to the entire main bole. For smaller forks, or for branches connected to a main bole (even if the main bole is not a tally piece), characteristics should pertain only to that portion of the piece up to the point where it attaches to the main bole.



G. Tagging CWD. Mark qualifying pieces in decay classes 1 through 3 at point of intersection with a diameter nail. Position the nail on top of the piece at the point of intersection with the transect. If possible, pound the nail into the piece so that only about 3 cm of the nail is left exposed; stop driving the nail if the next blow means breaking the piece or seriously disturbing the location of the piece.

H. Recording procedures. Record each piece as a single line entry on the data recorder. Complete the items indicated in the CWD tally guide.

If no logs are tallied on a given transect, record one line as follows: record the subplot number (PT), transect identifer (TI), the slope distance for the transect (LINE DIST), "000" in species (SPC), and enter "No Tally" in remarks.

Note (again): Do not record pieces that are intersected by a transect and are part of a slash pile or windrow. Instead, tally the pile according to instructions on "Sampling Piles and Windrows" on page 236.

CWD TALLY GUIDE

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	
	PT	TI	LINE DIST (CM)	CWD DIST (CM)	SPC	DIAM	TRNST DIAM (CM)	SML DIAM (CM)	LGE LENGTH (CM)	DECAY CLASS (M)	# CONT	ORNT	HOL?	REMARKS
	XX	X	LLLL	XXXX	XXX	XXXX	XXXX	XXXX	XX	X	XX	X	X	

L - Record only on the last record on each transect.

I. Individual data items.

Item 1--Subplot number (PT). Record a 2-character code indicating the subplot center from which the transect originates.

Item 2--Transect identifer (TI). Record a 1-letter code indicating the transect on which the log is sampled. The transect identifer codes are:

Code	Identifier
N	Log is tallied on the transect extending 360 degrees from point center.
E	Log is tallied on the transect extending 90 degrees from point center.

Item 3--Transect slope distance (LINE DIST) (cm). Record a 4-digit code on the last data line recorded for a transect indicating the measured slope distance from subplot center to end of the horizontal 17-meter transect or to where the transect intersects another condition class boundary. Measure and record to the nearest centimeter. Transect slope distance is recorded only on the last data line recorded for a transect. Transect slope distance will enable us to sample the same transect distance in future inventories.

Item 4--CWD slope distance (CWD DIST) (cm). Record a 4-digit code indicating the slope distance from subplot center to the point where the transect plane intersects the longitudinal center of a tallied piece. Measure and record to the nearest centimeter.

If two or more tallied pieces have the same distance, indicate in remarks how the pieces are arranged. For example: the transect intersects two logs--one on top of the other--so that the distance recorded to the nearest decimeter is the same.

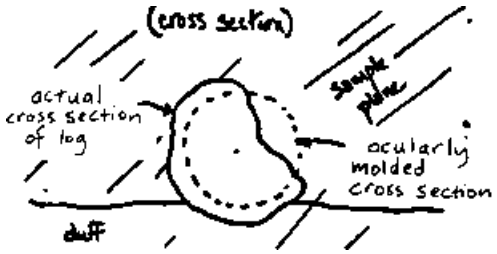
CWD slope distance will help us in future inventories to determine the status of CWD that we sample in the current inventory.

Item 5--Species (SPC). Record a 3-digit code indicating the species of the log. Species codes are the same as those used for "trackable" trees.

Even if species identification is difficult or uncertain for pieces of decay classes 1-4, make an "educated guess." In particular, it is important to distinguish hardwoods from softwoods. The piece's bark (either attached or sloughed and laying beside the piece) and the branching pattern--if branches are still present--may provide clues.

Item 6--Diameter at point of intersection (TRNST DIAM) (cm). Record a 4-digit code indicating the log's diameter at the point of intersection with the sample plane. Estimate the currrent outside diameter to the nearest centimeter; a measured diameter is necessary only if the diameter is within 2 centimeters of 12.5 cm.

Do not attempt to reconstruct for missing bark or wood. For pieces that are not round in cross-section because of missing chunks of wood or due to "settling" due to decay, occularly mold the cross section of the piece into a circle of the same cross-sectional plot, and estimate what the diameter of that circle would be. This applies to transect, small-end, and large-end diameters.



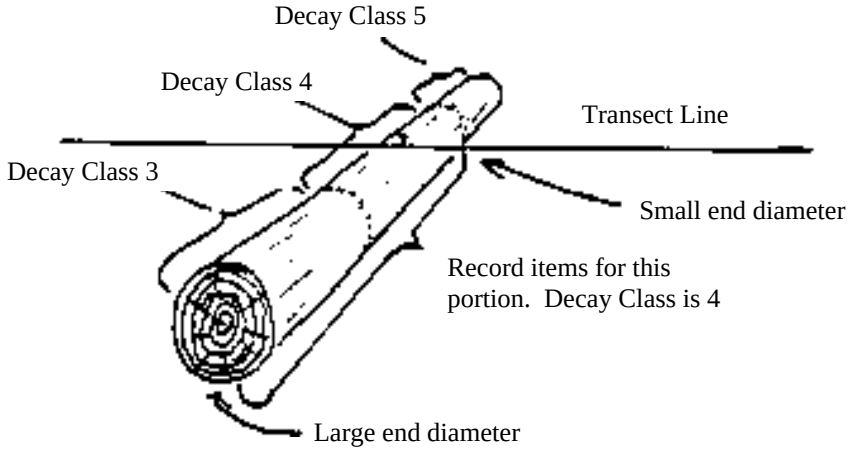
Item 7--Diameter at small end (SML DIAM) (cm). Record a 4-digit code indicating the diameter at the piece's small end to the nearest centimeter. The small end diameter occurs either at (1) the small diameter end of the piece if the small end diameter is >12.5 cm diam, or (2) at the point on the piece where the diameter tapers down to 12.5 cm.

Item 8--Large end diameter (LGE DIAM) (cm). Record a 4-digit code indicating the large-end diameter of the piece. Estimate to the nearest centimeter. The large-end will occur either at a broken or sawn end, at a fracture, or at the root collar.

Item 9--Length (LENGTH) (m). Record a 2-digit code indicating the total length of the piece. Estimate and record to the nearest meter. In estimating length, include only that portion of the piece that is 12.5 cm in diameter or larger and in decay classes 1 through 4.

Item 10--Decay class. Record a 1-digit code indicating the decay class of the log. Describe the decay class of the log at the point of intersection. (Logs may consist of more than one decay class.)

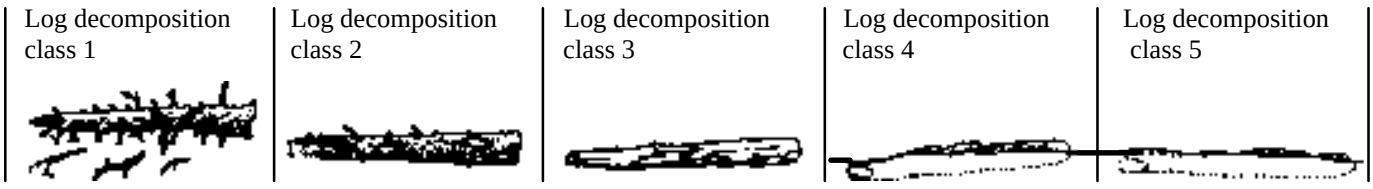
Code	Decay class
1	1
2	2
3	3
4	4
do not tally	5



Use the following table as a guide only, as the characteristics refer to Douglas-fir logs. Use the illustration below in combination with the table of charactertistics, especially the structural integrity and texture of rotten portions. Do not tally pieces that are decay class 5 at the point of intersection. When tallying a piece, the portion sampled ends where decay class 5 begins.

CHARACTERISTICS OF DOWN LOGS BY DECAY CLASS

Decay class	Bark	Structural integrity	Twigs less than 3 cm	Texture of rotten portions	Color of wood	Invading roots	Vegetation on log
1	intact	sound	present	intact	original color	absent	none
2	intact	sound	absent	mostly intact; sapwood partly soft	original color	absent surviving	none
3	sloughing	heartwood sound; supports own weight	absent	hard, large pieces	reddish brown or original color	sapwood only	conifer seedlings
4	detached or absent	heartwood rotten; does not support own weight; branch stubs pull out	absent	soft, small blocky pieces	reddish or light brown	through-out	hemlock less than 15 cm dbh smaller shrubs; moss
5	detached	none; branch stubs and pitch pockets usually have rotted down	absent	soft, powdery when dry	red-brown to dark brown	through-out	hemlock up to 200cm dbh;shrubs (some large); moss



Item 11--Number of other logs contacted (CONT). Record a 2-digit code indicating the number of other logs the tally log contacts. Do not count decay class 5 logs! Count only those logs that are at least 1 meter long and > 12.5 cm diameter at point of intersection and at small end.

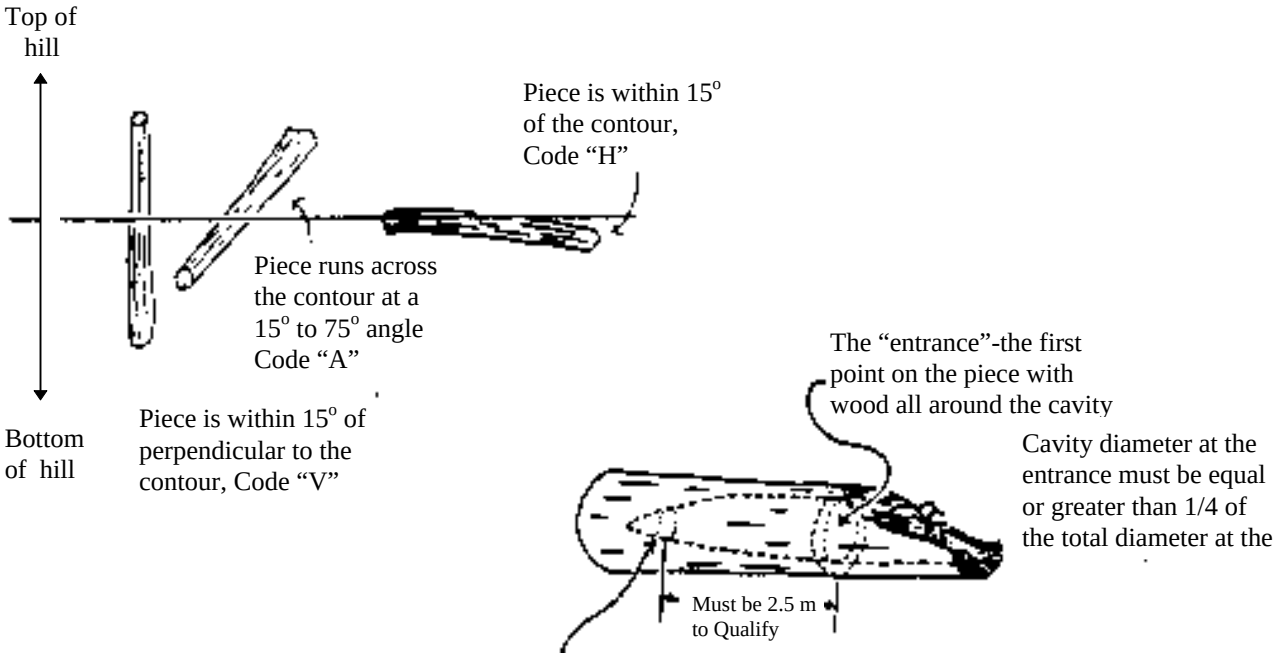
Item 12--Orientation on slope (ORNT). Record a 1-letter code indicating the orientation of the log on the slope.

Code	Orientation
H	Piece is oriented within 15 degrees of the coutour.
A	Piece is oriented across the contour.
V	Piece is oriented within 15 degrees of perpendicular to the contour.
F	Piece is on flat ground (0-10% slope).

Item 13--Is the piece hollow? (HOL?). Record a 1-letter code indicating whether the piece is hollow.

Code	Description
Y	The piece is hollow.
N	The piece is not hollow.

A piece is hollow if a cavity extends at least 0.5 meters along the central longitudinal axis of the piece and the diameter of the entrance to the cavity is at least one-quarter the diameter of the piece where the entrance occurs. The entrance occurs at the point where the circumference of the cavity is whole--the point where wood is first present completely around the circumference of the cavity. The length of the cavity begins at this entrance.



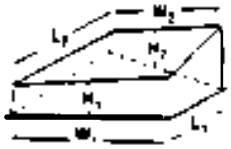
J. Sampling Residue Piles. The line transect method is not feasible when sampling CWD within residue piles and windrows. Piles and windrows will be sampled on a 17-meter fixed-radius plot.

Only piles and windrows created directly by human activity are candidates for sampling using these instructions. Examples of piles caused by human activity are slash piles, YUM (Yarded Unmerchantable Material) piles, debris piles left around landings after yarding, and windrows created using bulldozers. CWD in piles created by windthrow, landslides, fires and other natural causes should be tallied on the line transects.

The following procedures apply when sampling piles created by human activity:

a.) Determine which piles and windrows are partially or entirely within 17 horizontal meters of point center.

b.) For each of these piles, examine its shape and decide which of the four shapes diagrammed below most resembles the pile.

Shape Code 1	Shape Code 2	Shape Code 3	Shape Code 4
			
Record W_1 H_1	Record W_1 H_1 L_1	Record W_1 H_1 W_2 H_2 L_1	Record W_1 H_1 W_2 H_2 L_1 L_2

c.) Record pile data on the pile tally sheet. Each sampled pile is a separate line entry. On the tally sheet, record the point number, azimuth from the point to the center of the pile, and shape code for each pile.

d.) Measure or estimate, and record average height, length and width dimensions for the each pile. Piles given shape code 3 require two separate width and height measurements. Piles given shaped code 4 require two separate height, width and length measurements.

Pile dimensions should be "ocularly smoothed-out" by the estimator--in effect, averaged out of unevenness occurring from irregular stacking and protruding pieces. If the pile is a windrow that is longer than 20 meters, record length as 20 meters and base your height and width estimates on the 20-meter segment in closest proximity to point center. Record all dimensions to the nearest meter.

e.) Estimate and record the proportion of pile's gross cubic volume that is within the 17-meter fixed-radius plot. The pile's gross cubic volume is the volume that one would calculate using the height, length and width data recorded in instruction b.). The pile's gross cubic volume includes pieces of CWD, non-CWD debris, any soil mixed up in the pile, and

airspaces within the pile.

IX. SNAG TALLY

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IX. SNAG TALLY

A. Objectives. Snags are an important special habitat feature for many species of wildlife. Snag data collected in California will be used in:

1) Evaluating current forest conditions--How do snag populations vary as a function of plant community, successional stage, and disturbance history? How well do current snag conditions meet the needs of snag-dependent wildlife?

2) Studying how snags change over time--How fast are snags being recruited? What kind of trees are being recruited (species, age, growth impactors, cull, size, etc.)? How fast do standing dead trees decay? At what rate do they disappear, and what causes their disappearance (natural decay processes, firewood use, etc.)?

B. Snag selection

1) Newly established subplots (N#) or Reconstructed subplots (C#) tally all snags by the same selection criteria used at OCC 2:

a) "In" with the 7M BAF prism and within the 17-meter fixed-radius plot
b) At least 22.5 cm in dbh and at least 2 m tall at OCC3.
c) Leaning less than 45 degrees from vertical. Snags may be either (1) self-supporting, by the tree's root system, or (2) supported by another tree or other object ("leaning").

Note: Snags include stumps which meet the snag selection criteria.

2) Remeasured subplots (##).

a) Account for all snags tallied at OCC 2.
b) Trackable trees that were at least 22.5 cm dbh and 2 m tall at OCC 2 and are now tallied as TH 3 or TH 5 should be entered again as a TH 7 using the same 5-digit line number if they qualify as a snag at OCC 3. Missed vs ongrowth snags: On remeasured subplots we are not tallying trees which have "grown in" since OCC 2 and died. However, we will tally missed snags. To help distinguish between the two, remember that a missed snag must have been at least 22.5 cm dbh and 2.0 m tall at OCC 2.

3. Marking Snags

Mark each snag with an aluminum nail at where breast height was measured.

C. Data recording. Record one line for each snag tallied, completing data items as indicated below. For remeasured snags, the OCC 2 data are already printed/downloaded.

Item 1--Line number (LINE). 5-digit code printed/downloaded for OCC 2 tally snags. For new snags that were live tally trees at OCC 2, enter the same line number used for the corresponding TH 3 or 5. For new snags (snags not tallied at OCC 2), use a line number in the new tally series.

Item 2--Subplot number (PT). Record a 2-digit code for all snags, using the same codes as for trackable trees.

Item 3--Tree history (TH). Record a 2-digit code for all snags. The first digit is code 1-5 indicating the condition class that the snag is located in. The second digit will be 7 either for snags currently on the plot or for snags that were tallied at OCC 2 but are now "gone".

Item 4--Species (SPC). Record a 3-digit code for all snags, using the same codes as for trackable trees (see Item 4, page 156). Even if species identification is difficult or uncertain due to decay, make an "educated guess" if possible. In particular, it is important to distinguish hardwoods from conifers. The snag's bark (either attached or sloughed and laying beside the snag) and the branching pattern (if branches are still present) may provide clues to its species. If you absolutely cannot identify the species of snag, record "999" (species unknown). Snags tallied at OCC 2 will have a species printed/downloaded. If incorrect, update.

Item 5--Azimuth (AZ). Record a 3-digit code for all snags, using the same method as for trackable trees. (see Item 5, page 158). Update printed/downloaded azimuth if it is significantly different.

Item 6--Distance (DIST) (cm). Record a 4-digit code for all snags, using the same codes as for trackable trees (see Item 6, page 159).

Item 7--OCC 2 dbh (OC2 DBH) (mm). Printed/downloaded as a 4-digit code for snags tallied at OCC 2. Update, if necessary, to insure that the OCC 2 dbh is never smaller than the OCC 3 dbh.

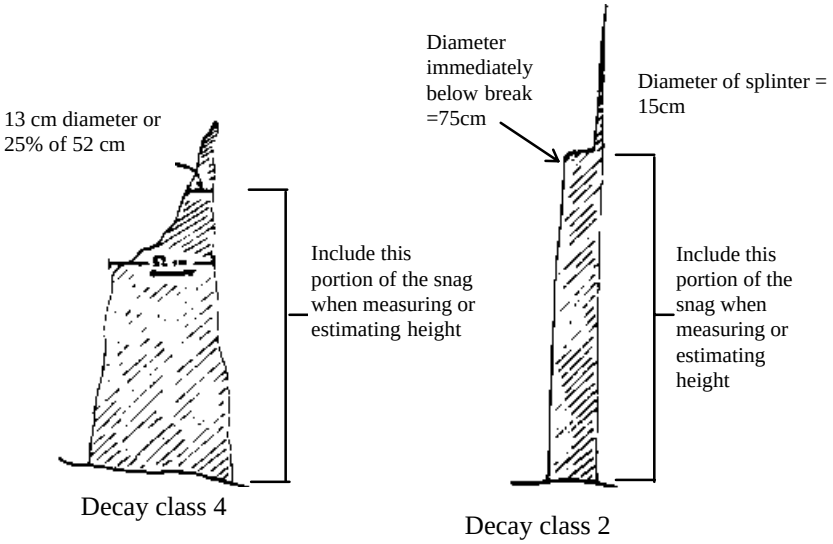
Item 8--OCC 3 dbh (OC3 DBH) (mm). Record a 4-digit code for all snags (except "gone" snags with a use/circumstance of disappearance (Item 19) code of 2-6). Record the snag's current dbh to the nearest millimeter. Snag dbhs may be estimated or measured. Measure or estimate dbh at a point 1.37 m above ground level, as for live trees. The recorded dbh indicates the diameter of existing material. Do not adjust the diameter for missing bark or chunks of wood.

Unlike living trees, snags can shrink (not grow) in dbh over time! If the OCC 3 dbh is larger than the OCC 2 dbh, double check (i.e. measure) the snag's current dbh--then record the measurement. If the OCC 2 dbh is smaller, correct it to read the same as the OCC 3 dbh. These situations may be attributed to the fact that OCC 2 snag diameters were often estimated or the snag has split apart in the decay process and now has a "bigger" diameter.

Item 9--OCC 2 height (OC2 HT) (dm). A 3-digit code is printed/downloaded for snags tallied at OCC 2. Update, if necessary, to insure that the OCC 2 height is never shorter than the OCC 3 height.

Item 10--OCC 3 height (OC3 HT) (dm). Record a 3-digit code for all snags indicating the snag's height to the nearest decimeter. Snag height may be estimated or measured, and should reflect the snag's actual height (the distance from ground level to the present top of the snag). Do not reconstruct for missing parts. This item not needed for "gone" snags.

Snags frequently have broken, irregular tops. When measuring height on such trees, use the "25% rule" to determine the point on the bole to which height should be measured. Include in your height estimate portions of splintered tops (usually on decay class 1 or 2 trees) that have a diameter that is at least 25% of the diameter of the "entire bole" immediately below the broken portion (see figure below).



Decay class 4

Decay class 2

Item 11--Growth Impactor (GI). Printed/downloaded as a 2-digit code for all snags tallied at OCC 2. The growth impactor code (called "damage/death" at OCC 2) indicated both decay class and use by wildlife as follows (do not change the printed/downloaded code):

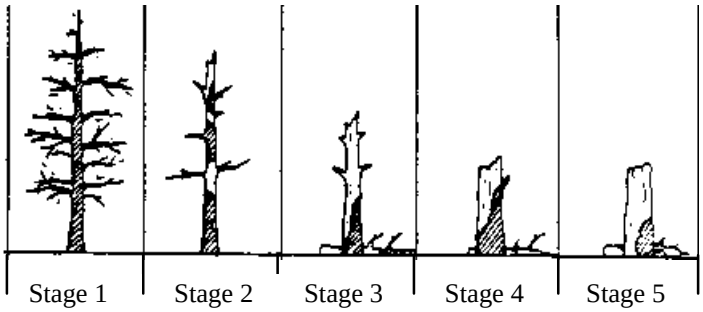
OCC 2 damage/ death code	Broad decay class and use
92	Hard snag with cavity or den.
93	Hard snag without apparent use.
94	Soft snag with cavity or den.
95	Soft snag without apparent use.

Item 12--Use or Circumstance of disappearance(D/U). Record a 2-digit code for all snags. If a snag is present, this item indicates use by wildlife (Codes 00-01). If a snag tallied at OCC 2 is now "gone", this item indicates the "circumstances of disappearance" of the snag (Codes 02-06). Codes and definitions are as follows:

Code	OCC 3 Use or Circumstance of disappearance	
00	TH 7; no cavity or den present.	SNAG PRESENT
01	TH 7; cavity or den present.	
02	TH 7; fell over "naturally" (wind, decay, etc.); still on ground.	
03	TH 7; fell over "naturally;" removed from site.	
04	TH 7; cut down and left on site.	SNAG "GONE"
05	TH 7; cut down and removed.	
06	TH 7; dbh and/or height no longer meet minimum for tally (snag "shrank" to less than 2 m tall and/or 22.5 cm dbh).	

A cavity is a hole that is large enough (> 2.5 cm in diameter) to be used by a "LBB" (little brown bird) for nesting.

Item 13--OCC 3 decay class (DC). Record a 1-digit code for all snags, indicating the snag's stage of decay. Use the figure (below) and table (next page) as guides.



Characteristics of Douglas-fir snags by decay class *

Snag Characteristics

Decay stage (code)	Limbs and branches	Top	% Bark Remaining	Sapwood presence	Sapwood condition	Heartwood condition
1	All present	Pointed	100	Intact	Sound, incipient decay, hard, original color	Sound, hard, original color
2	Few limbs, no fine branches	Broken	Variable	Sloughing	Advanced decay, fibrous,firm to soft,light brown	Sound at base, incipient decay in outer edge of upper bole,hard, light to reddish brown
3	Limb stubs only	Broken	Variable	Sloughing	Fibrous, soft, light to reddish brown	Incipient decay at base,advanced decay throughout upper bole, fibrous, hard to firm, reddish brown
4	Few or no stubs	Broken	Variable	Sloughing	Cubical, soft, reddish to dark brown	Advanced decay at base, sloughing from upper bole, fibrous to cubical, soft, dark reddish brown
5	None	Broken	Less than 20	Gone	Gone	Sloughing, cubical, soft, dark brown, OR fibrous, very soft, dark reddish brown, encased in hardened shell

* Characteristics are for Douglas-fir. Snags of other species may vary somewhat; use this table as a guide.

VIII. TRACKABLE TREE TALLY

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VIII. TRACKABLE TREE TALLY

A. Objective. The objective of the trackable tree tally is to obtain information on the density, growth, vigor, mortality, harvest, size, and volume of trees present on the plot.

Tally tree definitions

Seedling:	A tree less than 2.5 cm dbh that is at least 15 cm in height and established in mineral soil.
Sapling:	A tree 2.5-12.4 cm dbh.
Poletimber:	A tree 12.5 cm to 22.4 cm dbh.
Sawtimber:	A tree 22.5 cm dbh or larger.

B. Tree selection.

1. Prism tally on the 17-m fixed-radius subplot plot with a BAF 7 prism

Purpose--Large trees (>17.5 cm dbh) are more efficiently sampled with a prism than on a fixed-radius plot.

Using the prism. Use the prism to identify trees that are clearly "in" or "out." Tally all live trees that are within the limiting distance of the BAF 7 prism. However, do not tally trees which are outside the 17 meter fixed radius subplot even though they are apparently "in" with the prism. Trees >90 cm dbh are sampled on a 17-m fixed-radius plot in order to avoid tallying trees that are too far out to influence growing conditions at point center.

Checking trees. Use the following method to check trees which are not clearly "in" or "out" on the prism.

(1) Drive a nail into the tree at breast height (point C), at a location that is perpendicular to the sample point.

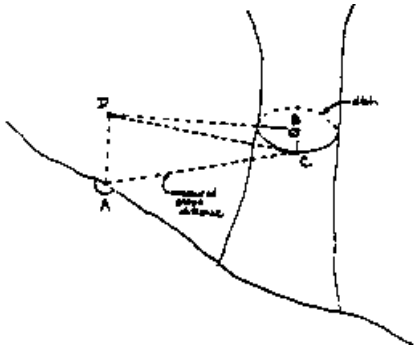
(2) With a tape, measure the slope distance from point C to point A.

(3) Using a clinometer, measure the slope along this line (sighting from point C to point A). Use the slope correction table in Appendix 4 to calculate the actual horizontal distance from C to A; this distance equals the distance from B to D.

(4) Compare this calculated horizontal distance with the limiting distance for a tree of that dbh. If the actual distance is less than the limiting distance, the tree is "in." If the actual distance is greater than the limiting distance, the tree is "out."

Limiting distances are presented in a table on p.181. The limiting distance for a particular tree may also be calculated using the following equation:

L = F x dbh where L = limiting distance in meters;
F = 0.18896 for 7 meter BAF prism.
dbh is in centimeters



2. 3.3 meter fixed-radius (trees < 17.5 cm dbh)

Purpose--Seedlings, saplings and poletimber trees are more efficiently sampled using a fixed-radius plot than a variable radius (prism) plot. The 3.3-meter radius is the limiting distance of a tree with a 17.5 cm dbh.

Tally trees less than 17.5 cm dbh when their "center at the base" is within 3.3 horizontal meters of subplot center (see figure below).

On remeasured subplots in condition class 1 be sure to account for all trees that were tallied and > 2.4 cm dbh at OCC 2.

A. Timberland and low site productivity forest land

On subplots where the subplot center is in timberland (GLC 20), or in low site productivity forest land (GLC 49) tally the fixed-radius in the following way:

Tally all trees 2.5 - 17.4 cm dbh that are in the 3.3 meter fixed-radius. When the total tally of trees 2.5 - 17.4 cm dbh on the 3.3 meter fixed-radius is less than 8, tally trees < 2.5 cm dbh until there are 8 tally trees < 17.5 cm dbh in the 3.3 meter fixed-radius.

B. Oak Woodland

On subplots where the subplot center is in oak woodland (GLC 44) tally the fixed-radius in the following way:

Tally all trees 2.5-17.4 cm dbh that are in the 3.3 meter fixed-radius.

Tally up to 8 trees < 2.5 cm dbh for each tree species found in a 5 meter fixed-radius.

Use the following rules for tallying seedlings

a) The seedling must be capable of living at least 10 years (Do not tally suppressed seedlings.)

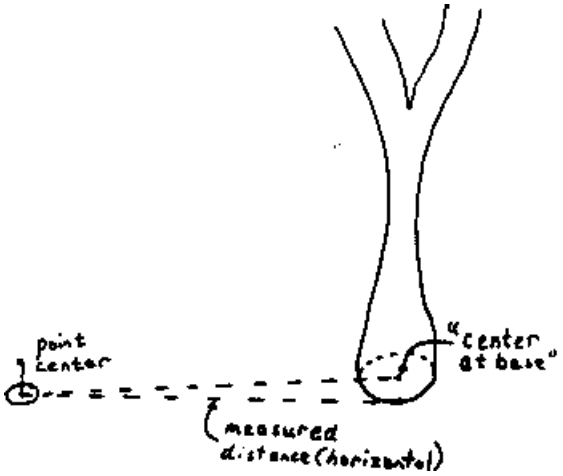
b) If a seedling is intermediate or overtopped, it must be .5 m from any other tally tree. If a seedling is dominant or codominant and less than 1.37 m tall, it must be at least .5 m from any other tally tree.

c) Do not tally conifer seedlings that will be overtopped by other conifers in the stand before they reach 22.5 cm in dbh. (Ignore residual overstory trees and sawtimber trees over-topping a tolerant understory.)

d) Tally seedlings with the following species priority where the ground land class of the condition class is GLC 20 or GLC 49. (There is no species priority for oak-woodland ground land class (GLC 44).)

1. conifer (other than incense cedar, yew, nutmeg, digger pine, cypress)
2. incense cedar
3. hardwoods as shown below:
   a. tanoak
   b. black oak
   c. chinquapin
   d. red alder
   e. other hardwoods

4. Yew, nutmeg, digger pine, cypress, juniper.



C. Tree identification and measurement.

Refer to the tally guides in Appendix 9 to determine what items to complete for a particular kind of tree. Tree data printed on the trackable tree tally record is from OCC 2.

Data recording --Record one line on the Husky data recorder for each tree. Complete the required items as indicated in the tally guide. If there is no tally on the subplot other than TH 7 or 9 record one line with the subplot number and a TH 0 and enter "NO TALLY" in remarks. Enter one or two additional lines with TH 9 for reference tree data. If no part of the 17 meter subplot includes timberland, or low productivity forest, or oak woodland on the 11K grid, enter one line with the subplot number and a TH 0 and enter "NO TALLY" in remarks but no reference trees are needed.

Item 1--Line number (LINE). 5-digit code printed on the trackable tree tally record for OCC 2 tally trees. New tally trees are assigned a line by the Husky and this code will not be changed by the field crew. A reference only (TH 9) tree will be assigned a new line number so the line can be used if the tree is now a tally tree. If a mortality tree (TH 5) is also to be tallied as a snag (TH 7) at OCC3, the same line number is to used.

Item 2--Subplot number (PT). A 2-digit code recorded for all trees on all subplots. The second digit is the OCC 3 subplot number. For the first digit follow the subplot numbering system below:

1) ## subplots. All subplots in condition class 1 which were established at OCC 2 and were neither moved nor substituted at OCC 2. All subplots in condition class 1 at OCC 3 which were in the same ground land class as point 1 at OCC 2. The 2-digit code is the OCC 2 point number followed by the OCC 3 subplot number (e.g. 11, 22, 33, 44, 55). Note: An oak-woodland subplot 5 will be numbered "25" if it was on an OCC 2 3-point plot, was neither moved nor substituted at OCC 2 and it is to be remeasured. (See page 24 on 3-point oak-woodland plots).

2) R# subplots. All subplots in condition class 1 which were moved, but not substituted, at OCC 2. The 2-digit code is the character R followed by the OCC 3 subplot number.

3) C# subplots. All newly established subplots in condition class 1 at OCC 3 which were in the same condition class as point 1 at OCC 2 and are not associated with an R subplot and are not in a new clearcut. The 2-digit code is the character C followed by the subplot number.

4) N# subplots. All subplots in condition classes 2-5. All new subplots in condition class 1 which have an R subplot associated with them. All new subplots in condition class 1 which are not associated with an R subplot but which are in a new clearcut. The 2-digit code is the character N followed by the subplot number.

5) P# subplots. All access-denied subplots in condition class 1 that were established at OCC 2. The 2-digit code is the character P followed by the subplot number. Access-denied subplots in ground land classes other than condition class 1 ground land class will be N# subplots.

Item 3--Tree history (TH). 2-digit code needed for all trees. The first digit is code 1-5 and indicates the condition class that the tree is located in. The second digit indicates the tree history. Codes on next page.

Cond Cls	TH	Tree History	Description
1-5	0	No tally	Enter a line with TH 0 for subplots which do not have any live tally trees (TH 1,2,4,6). Enter a line for nonforest subplots and GLC 44 subplots which are not on the 11K grid.
1	1	Remeasured	Tree tallied live at OCC2 and still live at OCC3.
1	2	New: re-constructed	Live tree in condition class 1 tallied for the first time at OCC 3.
2-5	2	New: not re-constructed	Live tree in condition class 2-5 at OCC 3.
1	3	Culturally-killed	Culturally-killed tree that was live at OCC 2. Tree was not harvested. It can be a stump, standing, or felled. Include trees killed in logging but not felled.Not tallied on N# subplots.
1	4	OCC3 Ingrowth	Tree tallied live at OCC 3 on 3.3-meter fixed-radius plot which was not alive at OCC 2 or was < 2.5 cm at OCC 2. Not tallied on N# subplots.
1	5	Mortality	Tree tallied or reconstructed as live at OCC 2 but now dead. Death was natural and not due to human activity. Include partially uprooted windthrows leaning more than 45 degrees. If the dead tree qualifies as a snag, record snag information on a separate line with the same 5-digit line # and a TH 7. Not tallied on N# subplots.
1	6	Missed tree	Live tree on a remeasured subplot which should have been tallied at OCC 2. Or a tally tree on the 3.3 meter fixed radius which was > 2.4 cm dbh at OCC 2 but did not qualify for tally at OCC 2. Requires reconstruction. Not tallied on N# subplots.
1-5	7	Snag	A standing dead tree which is > 22.5 cm dbh and > 2 meters tall at OCC 3. On remeasured subplots: Leave as TH 7 a snag tallied at OCC 2 but gone at OCC 3; leave as TH 7 a snag tallied at OCC 2 but < 22.5 cm dbh or < 2 meters tall at OCC 3. Do not tally snags on remeasured subplots which have "grown in" since OCC 2 and died, but tally missed snags. (See page 194).
1	8	Harvested	A tree tallied or reconstructed as live and > 12.5 cm dbh at OCC2 which has been harvested for industrial supply, firewood, local use or incidental reasons. Not tallied on N# subplots.
1-5	9	Reference	Reference only.

Item 4--Species (SPC). A 3-digit code indicating the tree species (see numeric codes below). The code is printed/downloaded for trees tallied at OCC 2. Change the printed/downloaded code if the species was misidentified at OCC 2 (note "species misidentified" in remarks column). Record a 3-digit code for all new trees.

Code	Species	Code	Species
014	Santa Lucia fir (ABBR)	212	Giant Sequoia (SEGI)
015	White fir (ABCO)	231	Pacific yew (TABR)
017	Grand fir (ABGR)	242	Western redcedar (THPL)
019	Subalpine fir (ABLA-2)	251	California nutmeg (TOCA)
020	Calif. red fir (ABMA-2)	263	Western hemlock (TSHE)
021	Shasta red fir (ABMAS)	264	Mountain hemlock (TSME)
022	Noble fir (ABPR)	312	Bigleaf maple (ACMA)
041	Port-Orford-cedar (CHLA)	330	Buckeye (AECA)
042	Alaska-cedar (CHNO)	351	Red alder (ALOR)
050	Cypress (CUP)	352	White alder (ALRH)
062	California juniper (JUCA-3)	361	Pacific madrone (ARME-3)
064	Western juniper (JUOC)		
065	Utah juniper (JUOS)	431	Giant chinkapin (CACH-2)
081	Incense cedar (LIDE-3)	492	Pacific dogwood (CONU-2)
092	Brewer spruce (PIBR)	510	Eucalyptus (EUC-3)
093	Engelmann spruce (PIEN)	542	Oregon ash (FRLA-2)
098	Sitka spruce (PISI)	600	Walnut (JUG)
101	Whitebark pine (PIAL)	631	Tanoak (LIDE-2)
102	Bristlecone pine (PIAR)	660	Apple (MAL-9)
103	Knobcone pine (PIAT-1)	730	Sycamore (PLRA)
104	Foxtail pine (PIBA)	746	Quaking aspen (POTR-3)
108	Lodgepole pine (PICO-1)	747	Black cottonwood (POTR-4)
109	Coulter pine (PICO-2)	748	Fremont poplar (POFR-3)
113	Limber pine (PIFL)		
116	Jeffrey pine (PIJE)	801	Coast live oak (QUAG)
117	Sugar pine (PILA)	805	Canyon live oak (QUCH-2)
119	Western white pine (PIMO-3)	807	Blue oak (QUDO)
120	Bishop pine (PIMU-1)	811	Engelmann oak (QUEN)
122	Ponderosa pine (PIPO)	815	Oregon white oak (QUGA-2)
124	Monterey pine (PIRA)	818	California black oak (QUKE)
127	Digger pine (PISA-2)	821	Valley (Calif) white oak (QULO)
133	Pinyon pine (PIED)	839	Interior live oak (QUWI)
201	Bigcone Douglas-fir (PSMA-2)	920	Willow (SAL13)
202	Douglas-fir (PSME)	981	California laurel (UMCA)
211	Redwood (SESE-2)	999	Other trees (identify in remarks) or unknown.

Although the following species occasionally attain tree size, they are always considered shrubs and are not tallied as trees.

Serviceberry (Amelanchier spp.)	Ceanothus (Ceanothus spp.)
Mountain mahogany (Cercocarpus spp.)	Red or water birch (Betula occidentalis)
Redbud (Cercis occidentalis)	Bush chinquapin (Castanopsis spp.)
Silktassel tree (Garryana spp.)	Ocean spray (Holodiscus discolor)
Rhododendron (Rhododendron spp.)	Hazel (Corylus spp.)
Poison-oak (Toxicodendron spp.)	Buckthorn (Rhamnus spp.)
Choke/Bitter cherry (Prunus spp)	Manzanita (Arctostaphylos spp.)
Elderberry (Sambucus spp.)	

Monumenting information. Information on tree azimuth, distance, and tree number is used for relocating and remeasuring the tree.

Item 5--Azimuth (AZM). 3-digit code describing the azimuth to the nearest degree from the subplot center to the tree. Printed or downloaded on the trackable tree tally record for remeasured trees; updated by field crew when the printed/downloaded azimuth is significantly different, or when the tree is a reference tree and a more accurately measured azimuth is required. Code a north azimuth as "360".

Item 6--Distance (DIST). 4-digit code indicating the slope distance, in centimeters, from the subplot center to the head of the nail that affixes the tree number tag. Printed or downloaded on the trackable tree tally record for remeasured trees. Change the printed/downloaded code only on trees when: (1)the printed distance is significantly different, or (2) the tree is a reference tree. Record a distance on all live tally trees and snags.

Item 7--Tree number (TRN). 3-digit code. Tree numbers of 001-999 are valid codes. Record a 3-digit code for all trees 12.5+ cm dbh. For remeasured trees the tree number is printed/downloaded; change the code if you change the tree number tag on the tree.

All live trees 12.5 cm dbh and larger that are part of the OCC 3 sample must be marked with an aluminum tree number tag.

Do not use the same tree number more than once on the same plot! Before leaving the vehicle, make sure the printed tree numbers for remeasured trees are not the same series as those you plan to use for new trees.

On remeasured trees, you may reuse the OCC 1 or 2 tree number tag or attach a new one. If you reuse the existing tag, make sure it is pulled out far enough so it will not be overgrown before OCC 4. If it is more convenient to attach a new tree number tag, make sure the OCC 2 tag is discarded. If you cannot remove the tag, pound it flush with the tree base, so it will be overgrown and not confused with the OCC 3 tree number tag.

All new live trees (trees 12.5 cm dbh and larger tallied for the first time at OCC 3) must be marked with an aluminum tree number tag. Nail the tag to the tree below stump height, on the side of the tree facing the point. Drive the nail in only as far as necessary to firmly anchor it in the wood.

Item 8--OCC 3 increment (OC3 INC) and number of rings. This item is recorded only in condition class 1 on the trackable tree tally for all tree history 2 conifers 12.5+ cm dbh, and all tree history 1's which are being measured as half diameters at OCC 3 but which were measured as "full" diameters at OCC 2 (see below under "measuring dbh of trees which have grown together". It is a 3-digit code indicating the OCC 3 radial increment inside the bark (based on the calculated number of rings) to the nearest millimeter. OCC 2 inventory dates (month and year) for the trackable tree tally will be printed/downloaded for all trees needing OCC 3 increments.

Number of rings to count for OCC 3 increment. Diameter growth of most tree species in temperate forests of the western United States occurs between June 1 and August 1, and is often concentrated in the early part of that period. For determining the inventory period (number of tree rings to count), use the following guide.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
01	02	03	04	05	//////////		08	09	10	11	12

Do not count present inventory year if present date of inventory is one of these months.

Count one year if present, previous, or both inventories were in these months.

Do not count previous inventory year if previous date is one of these months of inventory.

Example 1: A plot in Santa Cruz County was established in October, 1983 and remeasured in March, 1992. The number of growing seasons is 8 -- 1983 through 1992.

Example 2: A plot in Del Norte County was established in June, 1981 and revisted in June, 1991. The number of growing seasons is 10.

Example 3: A plot in Mendocino County was established in April, 1977 and revisited in July, 1991. The number of growing seasons is 15.

Example 4: A plot established in July, 1980 in Trinity County is revisited in October, 1992. The number of growing seasons is 13.

Item 9--OCC 2 dbh (OC2 DBH) (mm). This item is printed or downloaded on the trackable tree tally record for all OCC 2 tally trees. It is a 4-digit code, indicating the OCC 2 dbh to the nearest millimeter. Change the printed OCC 2 dbh for trees whose OCC 2 dbh is suspiciously larger or smaller than the OCC 3 dbh.

OCC 2 dbh MUST be completed for "missed" and reconstructed conifers > 12.4 cm dbh (TH 6) and all conifers on C# subplots (reconstructed subplots) Bore the tree and enter the OCC 3 increment. The data recorder will calculate the OCC 2 dbh from the increment and the OCC 3 dbh. Do not bore hardwoods or trees that are <12.5 cm dbh at OCC 3. An OCC 2 dbh can be calculated on paper with the steps below.

How to calculate OCC 2 dbh from measured increment on paper:

a. Bore the tree just below breast height, on the side of the tree facing the point. If slope and tree size make this impossible, bore the tree on the side opposite the point.

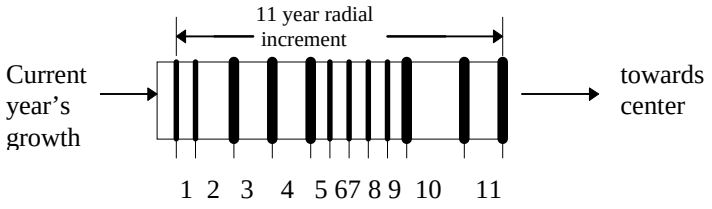
b. Beginning at the outside (bark end) of the core, count the number of rings since OCC 2 (year of OCC 3 inventory minus year of OCC 2 inventory). Record the number of rings you counted in the remarks column.

c. Measure the length of this segment of the core to the nearest millimeter. Multiply this value, which is radial increment, by two to determine diameter increment. Record diameter increment in remarks column.

d. Multiply the diameter increment from step c. by 1.1 to adjust for bark growth.

e. To determine OCC 2 dbh, subtract the answer in step d. from the measured OCC 3 dbh.

f. Enter "bored increment" in the remarks column.



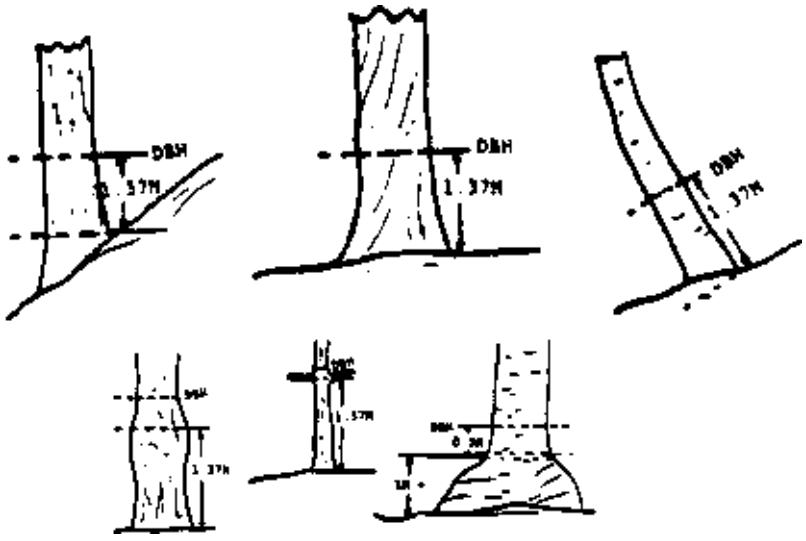
Item 10--OCC 3 dbh (OC3 DBH). Information on dbh is used in calculating volume, growth, and average stand diameter. It is also used in projecting mortality, cut, growth, and tree height.

Record a 4-digit code for live tally trees. The code indicates the tree's dbh to the nearest millimeter. Some OCC 2 saplings had "generic" dbhs (i.e. 0050, 0100). If the OCC 3 dbh is smaller than the OCC 2 generic dbh, do the following: If the tree is a hardwood or a conifer < 12.5 cm dbh, eliminate the OCC 2 dbh; if the tree is a conifer > 12.4 cm dbh, record an increment.

Marking dbh. All trees 7.5 cm dbh and larger must be marked with an aluminum nail at the height that dbh is measured. OCC 2 tally trees were marked with a dbh nail. Mark the same spot with a new dbh nail. Remeasure dbh at the old nail regardless of how high or low it is (note in remarks the height at which dbh was measured if it was greater than 5 cm higher or lower than breast height--1.37m). If the OCC 2 nail cannot be located, mark and measure the tree as noted below for new trees.

Mark new trees 7.5 cm dbh and larger with an aluminum nail at breast height (1.37 m above ground level from the root collar, measured at the uphill side of the tree). Avoid irregularities in the bole when placing the nail (see following figure). If the tree has swellings, bumps, depressions, or branches at breast height, affix the dbh nail immediately above the irregularity, at a point where the stem has normal form. For trees that sprout from a stump, affix the diameter nail 1.37 meters above the point where the sprout leaves the stump. Note the height of the dbh nail in remarks if it is above 1.42 m or below 1.32 m (i.e., 5 cm higher or lower than breast height). On level ground, affix the dbh nail on the side of the tree facing the sample point. On sloped ground, affix the dbh nail on the uphill side of the tree. Leave as much of the nail exposed as possible, making sure it is firmly affixed to the tree. If the tree is 75.0 cm dbh or larger, affix one additional dbh nail for every 30 cm of diameter, distributing the nails evenly around the circumference of the bole.

Tree on Slope | Tree on level ground | Leaning tree



Tree with swell at 1.37m | Tree with branch at 1.37m | Bottleneck tree

Measuring dbh. Measure dbh directly above the dbh nail. On trees without dbh nails (trees less than 7.5 cm dbh), measure dbh at a point 1.37 meters above ground level.

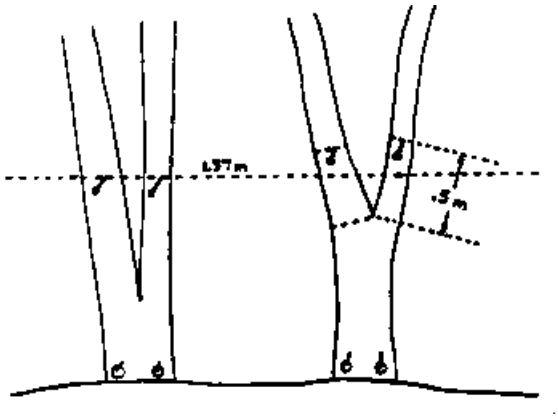
Before measuring dbh, remove any moss, poison oak or other vines, slugs, or anything else that may affect the diameter measurement. In addition, it may sometimes be convenient or necessary to remove a dead branch. Only chop off limbs if the accuracy and efficiency of the measurement would be increased. Never remove live limbs!

How to measure dbh under special circumstances.

1) Forked trees. Tally remeasured trees the same way they were tallied previously; if a tree was considered forked at OCC 2, consider it forked at OCC 3. Each fork that is 12.5 cm dbh or larger must be marked with a tree number tag on the side of the tree base where the fork occurs.

Crotch of fork at or above 1.37 m. Consider as a single tree. Measure diameter below the swell caused by the fork, but as close to 1.37 m as possible.

Crotch of fork below 1.37 m. Consider each fork as a separate tree. Measure diameter at 1.37 m above the ground or 0.5 m above the crotch of the fork, whichever point is higher on the tree. Forks are tallied with the prism if the fork is "in" where dbh is measured. Forks are tallied on the fixed-radius plots if the center of the tree at base is within the fixed-radius.



2) Diameter on trees that have grown together. When two tally trees have grown together at dbh, they may have the appearance of forked trees, but should be treated as separate trees.

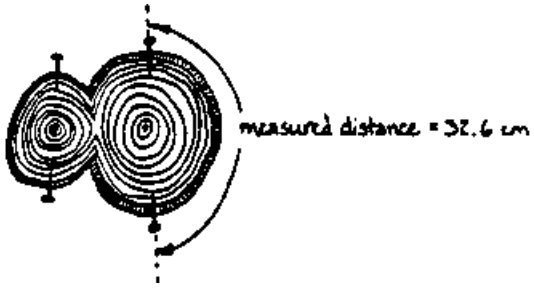
If the tree has a fully-measured diameter from a previous inventory, bore the tree for increment back to the time of full measurement. Fully-measured diameter means a diameter tape was extended completely around the tree to get the diameter measurement. Increment is bored--if possible--on the side of the tree facing the point. Bore at the height the previous diameter was taken.

Multiply the increment by two to get diameter increment since the measurement. Multiply the diameter increment by 1.1 to adjust for bark growth. Add the adjusted diameter increment to the previous measured diameter to get the current (OCC 3) diameter. Record the current diameter. Then, divide the current diameter by two to determine a "half" diameter.

Use the half diameter to place two diameter nails on the tree. Set the first nail at the height the previous diameter was measured. Use a diameter tape to measure out the half-diameter distance from the first nail. Set the second nail at the end of the taped half-diameter distance. If the tree was last fully measured at OCC 1, bore for increment between OCC 2 and OCC 3 and update the OCC 2 dbh. Note "half diameter" in remarks.

If the tree is a new tally tree, set two diameter nails at dbh halfway around the tree's circumference from each other. Measure the distance between the nails with a diameter tape. Multiply the measurement by 2 and record the result as OCC 3 diameter. Note "half diameter" in remarks.

If the tree is a remeasured tally tree with a "half diameter" from a previous inventory, measure the half-diameter indicated by the two diameter nails. Multiply the half diameter by two. Record the result as OCC 3 diameter. Note "half diameter" in remarks.



Example: Distance measured = 32.6 cm 32.6 X 2 = 65.2 Code OCC3 dbh "0652"

3) Impossible-to-measure trees. If it is physically impossible to measure the diameter of a tree with a diameter tape because of forking, huge root collars, cliffs, etc., then estimate the diameter as follows.

a) Determine where dbh should be measured. Mark dbh with a diameter nail, if possible.

b) Using a prism as a guide, move to a point on the ground at which the tree becomes borderline.

c) Measure the horizontal distance from this point to the center of the tree. This is the tree's limiting distance.

d) Using the limiting distance table on page 267, look up the diameter for this limiting distance.

e) Record this dbh and note "prism estimated dbh" in the remarks column.

Item 11--OCC 2 height (OC2 HT) (dm). 3-digit code, printed or downloaded on the trackable tree tally record indicating the total height of the tree. The height of the tree is recorded in decimeters. Estimated OCC 2 heights always end in "0" and measured tree heights never end in "0". Do not change the printed/downloaded OCC 2 height.

Item 12--OCC 3 height (OC3 HT) (dm). 3-digit code indicating the total height of the tree. The height of the tree is recorded in decimeters. Measured heights may not end in zero. Estimated heights must always end in zero, even estimated heights of deformed trees.

Record a height for:

* any tree with no recorded OCC 2 height
* all trees less than 12.5 cm dbh at OCC 2
* all TH 7s (snags)

On each subplot, record one measured OCC 3 height for saplings (2.5 - 12.5 cm dbh) over 5 meters.

For each species present on the plot, record an OCC 3 measured height for the first tree that has a measured OCC 2 height and has not lost its top since OCC 2. If the OCC 2 height proves unreasonable, take the next tree with an OCC 2 measured height. If a species present on the plot has only estimated OCC 2 heights, no remeasured OCC 3 heights are required for that species.

If the OCC 3 height is less than the printed/downloaded OCC 2 height, make sure the OCC 3 height is accurate. If it is, the data recorder will note that you are aware of the discrepancy and it will delete the OCC 2 height when the OCC 3 height is re-entered.

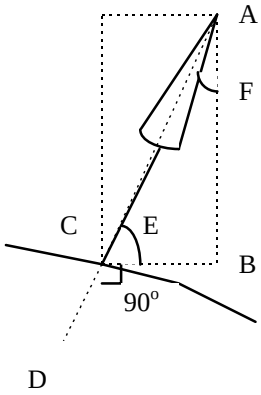
Use the following guidelines for measuring or estimating tree heights.

Heights on normally-formed trees: Normally-formed height is the actual distance from the base of the tree (on the uphill side) to the tip of the tree. A normally-formed conifer has a central bole and no deformities (such as a crook, fork, or missing top). A normally-formed hardwood has a complete bole with no missing top. Some hardwood species (e.g. alder and cottonwood) typically have a single bole well up into the crown. Other species (e.g. oak, maple, ash, and madrone) typically fork much lower on the bole -- a condition that represents normal form for these species.

Heights on poorly-formed or broken-topped trees: Reconstruct total (normally-formed) tree heights by estimating what the height would be were there no deformity in the main bole. Deformities include missing tops, and large crooks and forks above 1.37 meters. As a basis for estimating the normally-formed height, measure the tree's actual (poorly-formed) height and examine normally-formed trees of the same species and age in the same stand. A tree with reconstructed OCC3 tree height is coded with an "R" in the column right of OCC3 height (example: 410R).

Heights on leaning trees: Measure or estimate total bole length (from the base to the tip of the tree), not the elevation of the tip above the ground. When measuring heights using a clinometer, the height is calculated using horizontal distance--slope must be corrected for! To measure heights of leaning trees using a clinometer, follow these steps:

1) Move to a point along a line (point D) that is perpendicular to the plane in which the tree is leaning.



2) Using your clinometer, measure the height of point A above point B.

3) By standing at the base of the tree and sighting up the bole with your clinometer, measure the slope of the bole in degrees (the left side of the clinometer scale). (Angle E in the diagram below)

4) Subtract the degrees of lean (step c.) from 90 degrees. This gives you the degrees of angle F.

5) By sighting through your clinometer, convert the angle calculated in step d. to a percentage.

6) Use the slope correction table in Appendix 4 (page 266) to determine the expansion factor for the percent slope determined in step (5). Multiply the expansion factor by the measured distance from point A to point B (step 2.). This gives the length of the bole (point A to point C).

Item 13--Breast-height age (BH AGE). A 3-digit code indicating the tree's age at breast height to the nearest year. This variable is used in determining stand age, and in regression analyses for tree growth and mortality and stand harvest. On trees tallied live at OCC 2, BH age is printed/downloaded and, if bored for age at OCC 1 or OCC 2, the age is followed by an asterik "*".

Record a 3-digit code for breast-height age of all live tally trees which are at least 1.4 meters tall.

The ages of trees may be estimated, but bored ages are preferred.

If you bore the tree for a breast-height age, record a "+" to the right of age. If you can determine breast-height age accurately by counting branch whorls on ponderosa pine, western white pine, noble fir, grand fir, and Douglas fir seedlings that are < 12.5 cm dbh record a "+" to the right of age.

Bore live tally trees representative of the range of species, tree sizes and age classes present on the plot. Estimate the age of the remaining trees using the bored ages as a guide. After boring the tree for age, leave the extracted increment core at the base of the tree (for the convenience of the check-plotter!).

On remeasured subplots, bore for age at least one live conifer tally tree > 12.5 cm dbh which was not bored at OCC 1 or OCC 2. Examine and correct, as needed, the printed/downloaded estimated breast-height age. Do not change the printed/downloaded age of remeasured trees that have died or have been cut since OCC 2; age will be backdated in the office by computer.

Bore for breast-height age at least one conifer on a subplot which has a tree history of 1 or 6 and an OCC 3 dbh > 12.5 cm that was less than 2.5 cm dbh at OCC 2. The breast height age on these trees should not exceed the number of years since OCC 2 plus the # of rings in the first centimeter of the core.

Determining breast-height age of large trees. To determine the age of a tree whose radius is greater than the length of the increment borer, use the following procedure:

1) Bore into the tree as far as possible, extract the core, and count the rings.

2) Count the number of rings in the inner 5 cm of the core.

3) While the increment borer is still in the tree, measure the length of the borer that is exposed.

4) Subtract this length (3) from the total length of the increment borer.

5) Divide the tree's dbh by 2.

6) Subtract (4) from (5). This gives you the distance by which you are short of reaching tree center.

7) Divide this number (6) by 5. This tells you how many 5-cm lengths you were short by.

8) Multiply this number (7) by the number of rings in inner 5 cm (2).

9) Add this number (8) to the total number of rings in the extracted core (1). This is the tree's estimated breast-high age.

10) Note "extrapolated age" in the remarks column.

Example: Determine the age of a 148.8-cm Douglas-fir. The core has 110 rings, and has 10 rings in the inner 5 cm. 2 cm of the 41-cm-long increment borer did not penetrate the tree. Each number below is associated with its corresponding step above:

1.) 110

2.) 10

3.) 2

4.) 41 - 2 = 39

5.) 148.8/2= 74.4

6.) 74.4 - 39 = 35.4

7.) 35.4/5 = 7.1

8.) 7.1 x 10 = 71

9.) 110 + 71 = 181 years breast-high

Item 14--OCC 2 crown ratio (C). 1-digit code printed/downloaded by computer for all live trees tallied at OCC 2. Codes are described below under OCC 3 crown ratio. Only change the printed/downloaded code if it is obviously incorrect. Estimated OCC 2 crown ratio for reconstructed trees.

Item 15--OCC 3 crown ratio (R). Record a 1-digit code for all live trees tallied. Crown ratio is the percent of the tree's total height that supports living crown. The tree's total height includes dead, broken, or missing portions of the tree. For trees of uneven crown length, ocularly transfer lower branches on the fuller side to fill holes on the sparse side until a full, even crown is created. Base your estimate on this "created" crown.

Crown ratio is one indicator of a tree's vigor. In data analysis, trees with a crown ratio of 30 percent or less are considered less vigorous. For this reason, be particularly careful when deciding between codes "3" and "4." You may want to use your clinometer to measure live crown ratios on these trees.

Compare estimate with the OCC2 code for reasonableness and continuity.

Code	Percent live crown
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81+

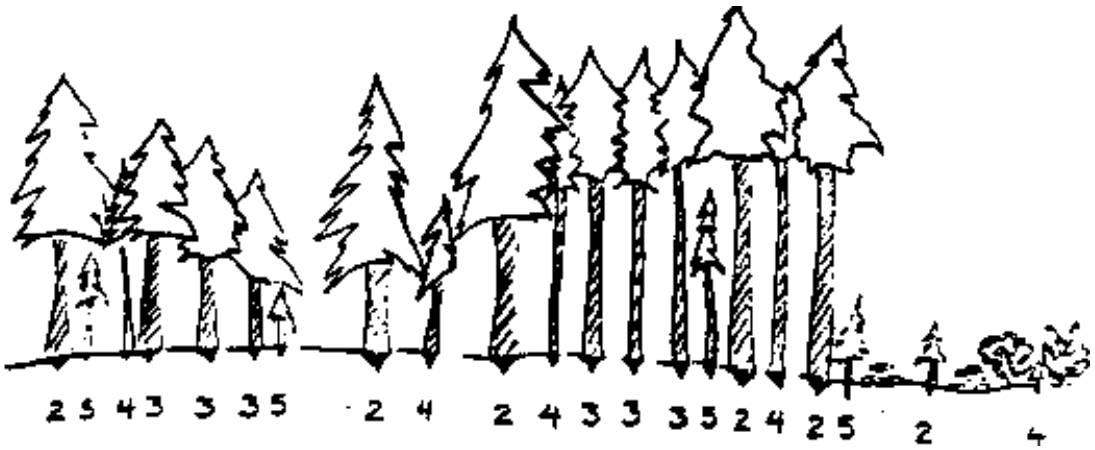
Item 16--OCC 2 crown class (C). 1-digit code, printed/downloaded by computer for all trees tallied at OCC 2. The code are listed below under OCC 3 crown class. Only change the printed/downloaded code if it is obviously incorrect. Estimate OCC 2 crown class for reconstructed trees.

Item 17--OCC 3 crown class (C). Record a 1-digit code for all live trees tallied. Crown class describes the tree's position in the stand; it indicates how well the tree is competing for light. This variable identifies trees that are "free-to-grow," and is used in growth projections.

Be sure to compare your estimate with the OCC 2 code for reasonableness and continuity.

Crown classes are described and coded as follows:

Code	Crown class	Description
2	Dominant	Crown extends above the general level of the canopy; it receives full light from above and some direct light from the sides. (Includes open-grown trees.)
3	Codominant	Crown is part of the general level of the canopy; it receives full light from above but little light from the sides. Crown is usually medium-sized and somewhat crowded by other trees.
4	Intermediate	Tree is shorter than dominants or codominants; crown is below or barely reaches into the main canopy formed by dominant and codominant trees. Crown receives little direct light from above and none from the sides. Crown is usually small and quite crowded against other crowns.
5	Overtopped	Crown is entirely below the general level of the canopy; it receives no direct light from above or from the sides.



Crown class illustration using codes

These codes are easily applied in even-aged stands. Classification is more difficult in uneven-aged stands or in plots where more than one stand is present. In these situations, classify the tree based on its immediate environment. In other words, base your classification on how much light the tree's crown is receiving. The intermediate and overtopped crown classes are meant to include trees seriously affected by direct competition with adjacent trees.

For example, a young, vigorous tree that is considerably shorter than other trees in the stand--but that is not overtopped by other trees and that receives full light from above and partly from the side--is classified as dominant. The same principle applies to two-storied stands: understory trees should only be assigned subordinate crown classes if they are adjacent to overtopping trees. In plots with scattered residual overstory trees over younger trees, a considerable portion of the understory trees will be classified as dominant or codominant.

Item 18--Growth impactor (GI). Record a 2-digit code for all live trees tallied. If a damage code was recorded by the field crew at OCC 2, the code has been converted to the appropriate OCC 3 growth impactor code and printed/downloaded. If the tree is now dead or cut, do not change the printed/downloaded code. If the tree is still alive, change or delete the printed/downloaded code in accordance with the current coding rules. Note: GI is also used for OCC 2 snags to indicate OCC 2 decay class and use by wildlife (see Chapter IX.)

Record a GI only when the tree meets the criterion for the particular factor being considered. Only record GI codes 25,27,30,40,50,80,90 when the damage will kill the tree within 10 years. Only record GI code 60 when overtopping by other trees will kill the tree within 10 years or prevent a sapling from attaining 12.5 cm dbh. Codes and explanations follow.

Code	Growth Impactor
00	None
11	Bark beetles
12	Defoliators
13	Balsam wooley aphid
14	Terminal feeders
15	Spruce budworm
21	Laminated root rot
22	Armillaria root rot
23	Blackstain root disease
24	Annosus root disease
25	White pine blister rust
26	Dwarf mistletoe
27	Other diseases and rot
30	Fire
40	Animal
50	Weather
60	Suppression
70	Excessively deformed sapling
72	Dead top, spike top, top out
73	Forked top or multiple stem
74	Deformed bole
75	Needles/leaves short, off color, sparse, etc.
80	Damage due to human activity
90	Other natural damage

A Guide for identifying and coding growth impactors.

Code	Growth impactor

11 Bark beetles. Code when serious damage characteristics are present on Douglas-fir, ponderosa pine or lodgepole pine.

Serious damage characteristics:

On Douglas-fir: needles turning yellow or red over most of tree (tree is dying); conspicuous boring dust in bark crevices; black pitch streaks in bark over much of bole. Ignore small amounts of clear or white pitch on the bole of the tree.

On pines: needles turning yellow to red over most of tree; small yellow to red pitch tubes (< 1 cm dia.) along bole; reddish boring dust in bark flakes and crevices, or around base of tree; gallery patterns under bark. Ignore copious excretion of yellowish to clear pitch.

Ips beetles on ponderosa pine: tops dead in immature trees; small areas of dense stands of dead saplings in which all trees are dead. Ignore mature trees with the top few feet of crowns fading or dead.

12 Defoliators. Code when serious damage characteristics are present on a tree.

Serious damage characteristics: Entire crown more than 25-percent defoliated. Top third of crown more than 50-percent defoliated or discolored. Leader deformed or killed. Current foliage with more that 25 percent of tips discolored or more than 25 percent of needles missing. Many branches with no new shoot growth. On hemlock and grand fir: code for any sign of defoliators.

13 Balsam wooley aphid. Code when damage characteristics or signs of aphids are present on true firs.

Damage characteristics:
On subalpine fir: Trees dying from the top downward with needles turning bright red; woolly material or dirty-white encrustations on the bark of the main bole.

On Pacific silver fir: Foliage thin and fading on individual branches fading throughout the crown; branch gouts: knob-like swelling on twig tips.

On grand fir: Flattened, thinning umbrella-shaped top; thinning and dieback of the crown from the top downward; new foliage growth reduced; nternodal branches dead and dying; severe pitching on the main bole.

14 Terminal feeders. Code when damage characteristics are present on ponderosa and lodgepole pines 1 to 6 meters tall.

Damage characteristics: Current terminal leader or tip may be curled or dead; shorter terminal (both total length as well as needle length) than lateral branches at first whorl; one or more side branches has assumed dominance.

15 Spruce budworm. Code when serious damage characteristics are present on Douglas-fir or true firs. Serious damage characteristics are the same listed for defoliators.

21 Laminated root rot. Code when Phellinus weirii is present in the tree. Most common in true fir, Douglas-fir, and hemlock.

22 Armillaria root rot. Code when Armillaria (mellea) ostoyae is present in he tree. Conifers and hardwoods are susceptible.

23 Black stain root disease. Code when Ceratocystis (Verticicladiella) wagenerii is present in the tree. Most common in Douglas-fir; occasional in hemlock and pine.

24 Annosus root disease. Code when Fomes (Heterobasidion) annosus is present in the tree. Most common in true fir and pine.

25 White pine blister rust. Code when white pine blister rust is present. This disease attacks most five-needled pines. Area and intensity of infection in sugar pine has increased dramatically in parts of California in the past few years.

Damage Characteristics: Yellow and red needle spots; spindle-shaped swellings often with small cuplike depressions on branches; cankers with dead roughened bark; flagging of branches and tops; mortality. In spring, clear, sappy ooze (pycnia) and white to yellow-orange spore pustules (aecia) appear on swollen portions of stems.

26 Dwarf mistletoe. Code if dwarf mistletoe (Arceuthobium spp) is the most important growth impactor and will kill the tree within 10 years, or has killed the tree.

27 Other diseases and rot. Code when any disease not previously listed will kill the trees within 10 years. May include: cankers; conks on tree or on ground near tree (e.g. Phaeolus schweinitzii, Phellinus pini); wilts; dry rot associated with sunscalds and mechanical damage; scabs and leaf galls; diebacks; white pine blister rust. Note the kind of disease in remarks.

30 Fire. Code when damage to the tree from fire will kill the tree within 10 years. Ignore basal scars unless they have girdled enough of the cambium to kill the tree. If foliage has been killed by fire, do not code fire damage unless foliage in the upper one-third of the crown has been killed.

40 Animal. Code when damage caused by animals will kill the tree within 10 years. Also code "40" for trees less than 12.5 cm dbh that are heavily browsed.

50 Weather. Code when damage caused by weather will kill the tree within 10 years. Examples of when to code: most of crown has been lost due to wind or snowbreak; bole has been shattered by lightning; tree has been partially uprooted by wind (and tree does not have root rot).

60 Suppression. Code when overtopping by other trees will kill the tree within 10 years, or prevent a sapling from attaining 12.5 cm dbh. Suppressed understory trees are common in old-growth stands. They may also occur in second-growth timber, or as residual trees after logging. Suppressed trees are usually characterized by extremely short or nonexistent internodes; twisted, gnarled stems; short, flat crowns that form an "umbrella"; or extremely sparse foliage.

70 Excessively deformed sapling. Code for trees 2.5-12.4 cm dbh that will never produce a minimum log. A minimum log is 2.5 m for hardwoods and 3.8 m for conifers.

72 Dead top, spike top, top out. Code if 1 or more meters of the top is dead or gone.

73 Forked top or multiple stem. Code if 1 or more meters of the top is forked or has multiple stems.

74 Deformed bole. Code if 1 or more meters of the bole is deformed.

75 Needles/leaves short, off color, sparse, etc. Code if tree is 20 or more percent affected.

80 Damage due to human activity. Code if any damaging agent will kill the tree within 10 years. Examples of damage or death due to human activity include scarring due to logging operations, exposure to herbicides, strangulation by fencing, and vandalism.

90 Other natural damage. Code if any damaging agent not listed above will kill the tree within 10 years. These may include natural mechanical injuries and damage or death due to an unidentifiable cause. Note the kind of damage in remarks

A. - GUIDE FOR IDENTIFYING INSECT DAMAGE

Bark beetles: Code whenever present.

Hosts: All conifer species.

Damage characteristics: Can be recognized as follows:

On Douglas-fir: needles turning yellow or red over most of tree (tree is dying); conspicuous boring dust in bark crevices; black pitch streaks in bark over much of bole.

On pines: needles turning yellow to red over most of tree or small yellow to red pitch tubes (< 1 cm dia.) along bole; reddish boring dust in bark flakes and crevices, or around base of tree; gallery patterns under bark.

Defoliators: Code whenever present.

Hosts: All conifer species.

Damaging characteristics: Needles showing signs of insect feeding and various stages of discoloration; insects (caterpillar scales or aphids) could be present in early spring and early summer; webbing may be present on needles; needles may be mixed (hollow and/or yellow to light green); needles sparse on branch tips and top of crown; branches with no new shoot growth; leader deformed or killed.

Terminal Feeders: Code whenever present.

Hosts: Ponderosa and lodgepole pine, 1 to 6 meters tall.

Damage characteristics: Current terminal leader or tip may be curled; shorter terminal (both total length as well as needle length) than lateral branches at first whorl; or dead (with or without needles).

Balsam woolly aphid: Code whenever present.

Hosts: All True firs.

Damaging characteristics: Gouting (knobby swellings on end of twigs and internodal branches); branches dead or dying; woolly or cottony masses on bole; severe pitching on main bole of grand fir.

Item 19--Cause of Death/Use or Circumstances of disappearance/Type of harvest(D/U). There are three ways to use this item depending on the tree history of the tally tree.

1) For trees that have died naturally (TH 5), record a 2-digit code to indicate the cause of death of a tree tallied as alive and 2.5 cm dbh or larger at OCC 2. Use the growth impactor codes above under Item 18. Data from this item explains the causes of tree mortality in the inventory unit.

2) For snags (TH 7) record a 2-digit code to indicate its wildlife use, or a 2-digit code to indicate its circumstance of disappearance. (See p. 143)

3) For stumps of harvested trees (TH 8) that were tallied or reconstructed as live and >12.4 cm dbh at OCC2 code the appropriate harvest class from the list below:

Code	Harvest Class
01	Harvested for industrial supply
02	Harvested for firewood or local use
03	Harvested for incidental reasons

Definitions:

Harvested for industrial supply means the tree was harvested for industrial roundwood or chips. The tree was not used for firewood or for products manufactured and used by "do-it-yourselfers", often on the property of origin for improvements such as fences, buildings and bridges. The tree was not an isolated removal. The tree was marketed and transported from the property of origin to wood-using plant or export operation.

Harvested for firewood or local use means the tree was harvested for firewood, or for wood products manufactured and used locally by "do-it-yourselfers", often on the ownership of origin, for improvements such as fences, buildings, and bridges. The tree was not marketed and transported to a wood-processing plant or export operation. The tree was not harvested as an isolated removal for incidental reasons.

Harvested for incidental reasons means the tree was harvested (1) as an isolated removal in an otherwise undisturbed stand or (2) as part of a harvest activity across a condition class boundary that resulted in the removal of one or more tally trees.

Item 20--Mistletoe (M). Record a 1-digit code for all live tally trees. The code indicates the degree of infection of dwarf mistletoe on conifers, and leafy mistletoe on hardwood, juniper, and incense cedar trees. This item is used in describing the extent and severity of mistletoe infection in the sample plot.

This item is printed/downloaded for all trees tallied as live at OCC 2. If the tree is alive at OCC 3, change the printed/downloaded code if it is inaccurate. If the tree is now dead, do not change the printed/downloaded code.

Dwarf Mistletoe on Conifers

Trees <7.5 cm dbh

Code	Description
0	No dwarf mistletoe infection.
1	Dwarf mistletoe infection in either upper or lower half of crown, but not in both. No brooms.
2	Dwarf mistletoe infection in both upper and lower halves of crown, or with one or more brooms anywhere in the crown.

Trees 7.5 cm dbh and larger

"Score" the mistletoe code as follows:

1. Visually divide the live crown into thirds
2. Score infections in each third as follows.

Score	Description (A bole infection counts as a branch infection.)
0	No infection.
1	Less than 50 percent of the branches infected; no brooms.
2	50 percent or more of branches infected; or one or more brooms.

3. Sum the scores for each third. Code the total.

Example: A tree has no infection in top third of crown, light infection in the middle third, and has two brooms in the lower third.

The total score is: 0 + 1 + 2 = 3; the code is: "3"

Leafy Mistletoe on Hardwoods, Juniper, and Incense Cedar

Any size tree

Code	Description
7	Leafy mistletoe present
0	No leafy mistletoe present

Item 21--Hardwood clump (CL). Record a 1-digit code for hardwoods tallied. A

Item 21-- Hardwood clump is defined as 3 or more hardwood stems originating from a root system from a tree now gone. Hardwood clumps typically arise from old stumps that are left from cutting or from natural mortality. Each fork of a forked tree counts as one stem if the fork is below dbh and must be entered on a separate line. Clump data are used in adjusting stocking estimates; trees growing in clumps contribute less stocking than those growing as individuals.

Code	Description
0	Tree is not a hardwood in a clump.
1	Tree is a hardwood in a clump.

Item 22--Cull other (CO). For conifers, alder, cottonwood and eucalptus trees > 12.5 cm dbh record a 2-digit code to indicate the percent of cull other and note the reason for the cull in "Remarks". For hardwoods (except alder, cottonwood and eucalptus) > 12.5 cm dbh record a 2-digit code that indicate the tree's form class.

Conifers, alder, cottonwood and eucalyptus 12.5 cm dbh and larger. This item indicates the percent of volume--to the nearest 10-percent--of the volume lost due to broken or missing parts, forks, or crooks. Code only when 1 meter or more of the tree is defective. Cull for hardwood forking only if the forking is not typical of the growth form for the species. Information on cull other is used in calculating net tree volume.

For conifers tallied as alive and > 12.5 cm dbh at OCC 2, this item has been printed/downloaded by computer. Use the printed code only as a guide. Determine percent cull according to the current rules, and correct the printed/downloaded codes if obviously in error. (Note: for trees that are now dead or cut which were >12.5 cm dbh at OCC 2, cull other indicates the cull at the time of the OCC 2 inventory and should not be changed.)

If the conifer does not have a minimum log (3.8 m), code this item "99."

If the alder, cottonwood or eucalyptus does not have a minimum log (2.5 m), code this item "99.

Use the following guide and tables showing merchantability standards and the percentage distribution of volume by log, to determine the percent of cull other.

a.) Top out. Cull one meter below the break for splintering, plus the entire top above the break.

b.) Fork. When the crotch of the fork is below 1.37 meter, treat as separate trees with no cull. When the crotch of the fork is above 1.37 meters, cull only if additional volume in a second stem does not compensate for the volume reduction in the main stem. Forked trees often have as much or more volume than trees without forks.

c.) Crook. Cull for one meter or more of buck-out loss (crook).

Merchantability Standards

	Size class (cm)	Stump height (cm)	Log length (m)	Minimum top diameter outside bark (cm)
SAWTIMBER:				
Conifer	22.5+	45	5.0	l8
Hardwood	27.5+	45	2.5	23
POLETIMBER:				
Conifer	12.5-22.4	30	2.5	10
Hardwood	12.5-27.4	30	2.5	10

Percentage distribution of total tree volume
for sawtimber conifers (22.5 cm dbh and larger)

(5-meter logs)

Tree height (in logs)	Log number											
	1	2	3	4	5	6	7	8	9	10	11	12
1	100											
2	70	30										
3	55	35	10									
4	41	31	20	8								
5	32	27	21	14	6							
6	27	23	19	15	11	5						
7	23	20	17	15	12	8	5					
8	20	18	16	14	12	9	7	4				
9	17	16	15	13	11	10	8	6	4			
10	16	15	13	12	11	10	8	7	5	3		
11	14	13	13	11	11	10	8	7	6	4	3	
12	14	13	12	11	10	10	8	7	6	4	3	2

Percentage distribution of total tree volume
for hardwoods and poletimber conifers (conifers 12.5-22.4 cm dbh)

(2.5 m logs)

Tree height (in logs)	Log number									
	1	2	3	4	5	6	7	8	9	10
1	100									
2	55	45								
3	41	33	25							
4	33	28	22	17						
5	28	24	20	16	12					
6	25	22	18	15	12	8				
7	22	20	17	14	12	9	6			
8	20	18	16	14	11	9	7	5		
9	18	17	15	13	11	9	7	6	4	
10	17	16	14	12	10	9	8	6	5	3

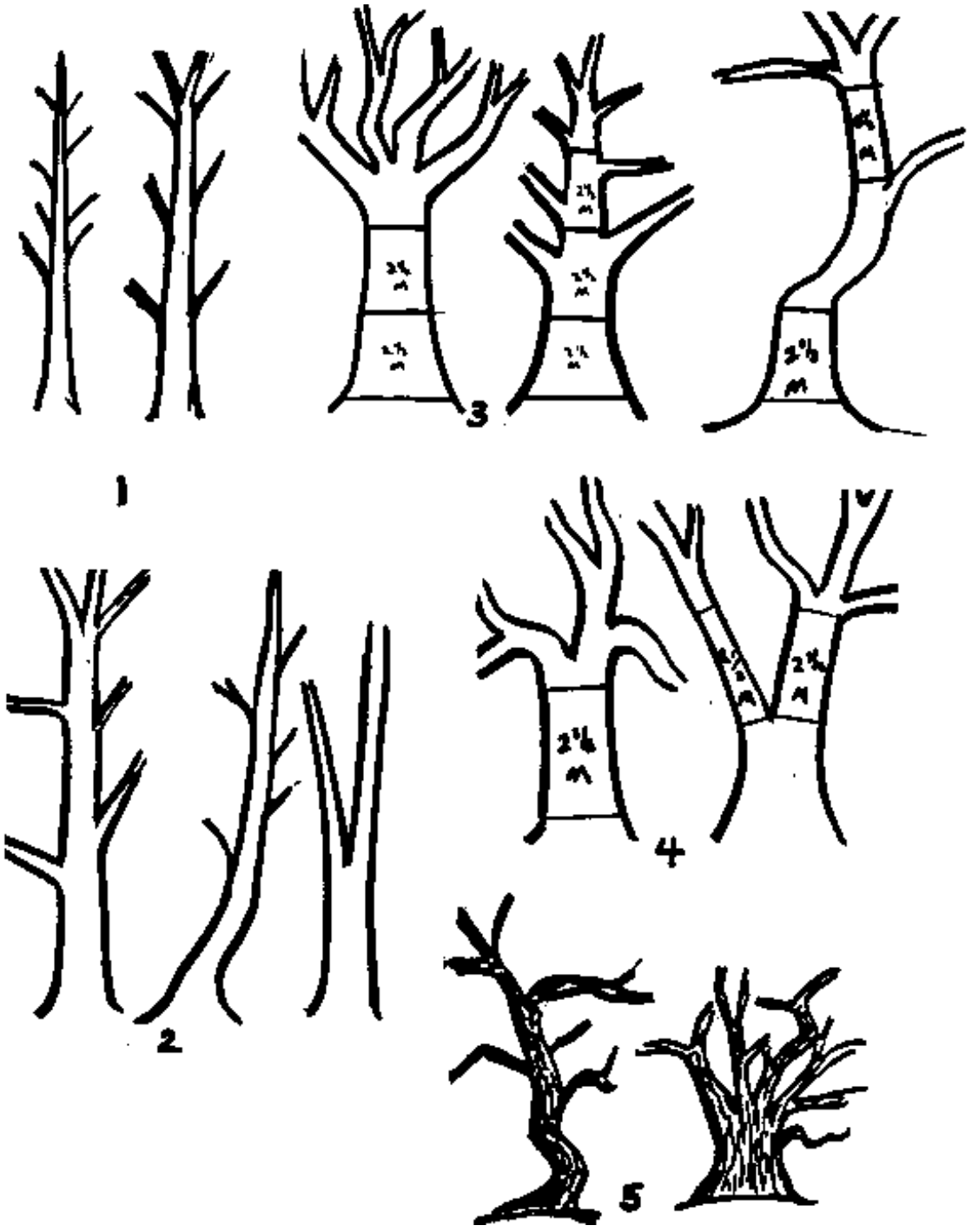
Hardwood Form Classes (not for alder, cottonwood, and eucalyptus)
(see following page for diagrams)

Code 1	First 2.5 meters above stump straight, straight bole, small limbs, less than 20 percent of top "lost" due to forking, rapid taper, or branching.
Code 2	First 2.5 meters above stump straight, similar to code 1, but with large limbs (more than 1/4 bole diameter); or crooks and forks present, but affecting less than 20 percent of volume. Includes straight-forking trees with little volume loss.
Code 3	First 2.5 meters above stump straight, run of the mill hardwood; rough with at least one straight 2.5 meter logs in main bole.
Code 4	First 2.5 meters above stump not straight, but the tree must have one or more straight logs elsewhere.
Code 5	No logs anywhere in tree due to form. Includes the sea serpent tree, giant tumbleweeds, pretzels, cauliflowers, and various free form trees.
Code 6	Top out - 20 percent or more of tree volume is lost due to top out.

20 percent of volume is an estimate and is not calculated on a log by log basis. Volume means merchantable volume within the standards listed on p.133.

Straight Log Definition - A line drawn through the centers of both ends of the log, does not pass outside the curve of the log.

Hardwood form class diagrams



Item 23--Cull rot category (CR). Record a 1-digit code for all tally trees > 12.5 cm dbh except snags and reference trees (TH 7, 9). Cull rot is printed/downloaded for remeasurement trees. Determine the cull rot code according to the current rules and correct the code if obviously in error. Describe the reason for cull rot in "Remarks". The code indicates the broad decay category of the tree, as described below.

CODE	CULL ROT PERCENT
0	0-9
1	10-32
2	33-74
3	75-100

Information on cull rot is used with information on cull other to calculate the net volume of trees.

Base the code for cull rot category on visible indicators of cull, using the log lengths and percent distribution tables in the previous section. Follow these steps in coding this item:

Code 3

a.) Trees with Echinodontium tinctorium conks separated by more than 1.5 meters of vertical distance.
b.) Douglas-fir over 140 years with Phellinus pini conks or swollen knots separated by more than 3 meters vertical distance.
c.) Polyporus amarus, pecky cedar rot, conk or shot hole cup.
d.) Phellinus igniarius conk on hardwood.
e.) If 60 percent of merchantible bole (from ground up) is rotten.
f.) If top half of merchantible bole is broken out in combination with any indicators for codes 1 and 2.

Code 2

a.) E.T. conk.
b.) P.Pini conk on Douglas fir over 140 years.
c.) Quinine conk
d.) Log(s) is/are 100 percent rotten (from the butt log up). Use the log distribution tables on page 187.

Code 1

a.) Determine if cull is affecting between 10-32 percent of the total tree volume using the log distribution tables on page 187.

A GUIDE FOR DECAY INDICATORS AND THEIR VOLUME REDUCTION FACTORS

Fungus	Tree	Visible Indicator	Code
Phellinus (Fomes) pini (Red ring rot)	Douglas-fir Hemlock W.larch true firs	Conk mostly on tree stems, often on knots or branch stubs.	1,2, or 3
Echinodontium tinctorium (Rust red stringy rot)	True firs Hemlocks	Hard, woody, hoof-shaped conks on branch-stubs.	1,2,or 3
Polyporus amarus (Pecky rot)	Incense-cedar	Hoof-shaped conks on bark above open knots. Early rot is yellowish-brown discoloration in heartwood. Advanced rot is dark-brown and crumbly, with holes or pockets.	1,2 or 3
Poria subacida (Butt rot)	Hemlocks, W.white pine Engelmann spruce True firs W.redcedar	Large butt scar, or crust-like, white to buff colored conk, usually found under root crotches.	1
Fomes robutus F. hartigii (Concealed conk)	W.hemlock	Brown, crust-like conk found on under-side of branch stub.	1
Fomitopsis annosa (Butt rot)	Hemlocks W.white pine spruce true firs	Flat or bracket-like conk near root collar On infected scar	2 1
Phaeolus schweinitzii (Red brown butt rot)	Douglas-fir Sitka spruce W.white pine Lodgepole pine true firs	Velvety brown conk near base of tree. Conks plus fire scar	1 1
Fomitopsis cajanderi (Top rot)	Douglas-fir Hemlocks	Small conk with rosy lower surfaces; broken top.	1

VII. VEGETATION PROFILE

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VII. VEGETATION PROFILE

REQUIRED TALLY FOR THE VEGETATION PROFILE

1. Remeasure the 5-meter fixed-radius vegetation profile on all remeasured subplots where subplot center is timberland (GLC 20), low-productivity forest (GLC 49) or oak woodland (GLC 44) on the 11k grid.

2. Establish a new vegetation profile at any other subplot where subplot center is timberland (GLC 20), low productivity forest (GLC 49) or oak woodland (GLC 44) on the 11 k grid.

3. Do not remeasure the vegetation profile on R# subplots.

4. If the 5-meter fixed radius straddles two condition classes, measure only the area which is in the condition class of the subplot center. Record what percentage of the 5-meter fixed radius is being measured under "% VEG. PROF. IN AREA" on the VEGETATION PROFILE. All references below to the 5-meter fixed radius refer to that part of the 5-meter fixed radius which is being measured. Only a condition class boundary can reduce the area to be measured. Nonstockable areas or nonforest inclusions do not reduce the area to be measured.

A. Objectives. Information on the structure and species composition of plant communities has been used for many purposes. Vegetation profile data has been used to assess fuel loading and fire hazard, describe the ecological setting of Pacific yew, determine the distribution and occurrence of understory species of special interest, and evaluate wildlife habitat.

B. General tally procedures. Line entries are listed in three plant groups -- tree seedlings, shrubs, herbs. On each line record a valid California species code, a layer, and percent cover. For shrubs also record stage of development. Selection criteria: For tree seedlings: record the species if it is present. For shrubs and herbs: record the species if it covers at least 3% of the 5-meter fixed radius.

Where present, OCC 2 data have been printed/downloaded in the appropriate section. On remeasured subplots, OCC 2 species, OCC 2 percent cover, and OCC 2 stage of development (for shrubs) are printed/downloaded. Enter the appropriate OCC 3 data on the same line, as described in the following paragraphs. A plant species may be entered twice if it is in two distinct canopy layers.

Is it a tree or is it a shrub? A tree is defined as a woody plant that commonly has an erect perennial stem or trunk at least 7.5 cm dbh and a total height at maturity of at least 4 meters. Though the following species may attain tree size, they are always to be listed as shrubs and not as tree seedlings on the vegetation profile:

Serviceberry (Amelanchier spp.)	Ceanothus (Ceanothus spp.)
Mountain mahogany (Cercocarpus spp.)	Red or water birch (Betula occidentalis)
Redbud (Cercis occidentalis)	Bush chinquapin (Castanopsis spp.)
Silktassel tree (Garryana spp.)	Ocean spray (Holodiscus discolor)
Rhododendron (Rhododendron spp.)	Hazel (Corylus spp.)
Poison-oak (Toxicodendron spp.)	Buckthorn (Rhamnus spp.)
Choke/Bitter cherry (Prunus spp)	Manzanita (Arctostaphylos spp.)
Elderberry (Sambucus spp.)	

Any species not listed above which could become tree size should be recorded as a tree seedling rather than a shrub. An example might be willow (Salix spp.) in riparian zones.

C. Identifying the Species

Each line entry must have a species code recorded in the "OC2 SPP" or the "OC3 SPP" column, using the species codes listed in the plant guide. If you cannot identify a plant species while in the field, collect a sample for later identification. If you cannot identify the species of the plant, record the code for its genus if possible. If not, record one of the following: SHRUB (for any shrub), FORB (for any forb), GRASS (for any graminoid, including grasses, sedges, and rushes), or FERN (for any fern).

On remeasured vegetation profiles, compare the printed/downloaded OCC 2 species codes with the vegetation on the 5-meter fixed-radius subplot. If OCC 2 species is correct, you do not need to enter an OCC 3 species. OCC 3 data (layer, percent cover and stage of development) are entered on the same line. If an OCC 2 species needs to be changed record the updated species in the "OC3 SPP" column; never delete the OCC 2 species code.

Splitting/Lumping. If plants were lumped into groups at OCC 2 that can be separated into species at OCC 3, add new lines for them. On the added lines, complete the OCC 2 as well as the OCC 3 percent cover, layer, and stage of development. For each subplot, the sum of the OCC 2 percent covers of the two or more added lines should be equal to or less than the OCC2 percent cover of the group that is being split if they are in the same layer. If some of the grouped OCC 2 percent cover is not accounted for, record the remainder on the group line. If all is accounted for, record "00" in the percent cover for the OCC 2 group. In the OCC 3 column, record the percentages for each split out species, and put any remaining percentage in the group code.

Misidentification. If the species was obviously misidentified at OCC 2, record the correct species in the OCC 3 species column. OCC 3 data are entered on the same line as the OCC 2 data.

Missed species. If a species was obviously missed at OCC 2, add a new line for it. The OCC 2 percent cover for missed species equals the OCC 3 percent cover.

New Species. If a tree species was not recorded at OCC 2 and is now present, record it. If a shrub or herb species was not recorded at OCC 2 and is now present with at least 3 percent cover, record it. Record OCC 2 percent cover as zero for these "ingrowth" shrub and herb species.

D. Canopy layer. Record a 1-digit canopy layer code for each line entry. The code indicates the height of the species at OCC3. A species can be in two canopy layers by repeating the species code on an additional line. The codes correspond to the canopy layers and heights on the Subplot Attribute Record.

E. Percent cover. Record a 2-digit percent cover. Trees can be recorded in trace (01%) amounts. For trees with more than a trace cover record percent cover to the nearest 5%. Record shrubs or herbs which have 3% or more cover and record percent cover to the nearest 5%. Code a "99" if the species covers the entire layer.

General rules. For each line entry estimate percent cover as the portion of the fixed-radius plot which is being measured that would be obscured by all plants of the species if viewed from directly above the fixed-radius plot. In estimating cover, include the entire area within the general outline of a plant; ignore minor gaps between branches, and holes in the center of the plant. Because of overlap, the sum of individual species within any one canopy layer can be greater than 100%. (Note: 20% cover means 20% of that part of the fixed-radius plot which is being measured; remember the part of the fixed-radius plot being measured may be less than the 5-meter fixed radius because of condition class boundaries.)

OCC 2 and OCC 3 percent cover of shrubs and herbs on remeasured subplots. For each shrub and herb species on the plot, OCC 2 percent cover estimates have been printed/downloaded. For these species, examine current conditions on the fixed-radius plot to see if "substantial change" (defined below) has occurred. If yes, record the current percent cover of the species in the OCC 3 percent cover column. If no, record the same percent cover for OCC 3 that is printed/downloaded for OCC 2.

Substantial changes in percent cover since OCC 2 are usually the result of a disturbance in the plot area between OCC 2 and OCC 3, or just prior to OCC 2. Examples of common disturbances are: timber harvest and management activities, grazing, natural events such as windthrow, insect kill, flooding, and fire. Substantial changes can also occur through natural succession in the absence of any discernible disturbance, and these also should be recorded.

In general, a change in percent cover of shrubs and herbs should only be recorded if the OCC 3 estimate differs from the OCC 2 estimate by at least 20-percent cover. We cannot be sure if differences of less than 20-percent cover are due to real change or to differences in the estimators (ocular estimates of cover are imprecise).

Changes of less than 20 percent can be coded under certain circumstances:

a) If the OCC 2 percent cover was coded as less than or equal to 30 percent, the percent cover can be changed in increments of 10 percent.

b) If you can see that a direct physical disturbance (e.g. a skid trail) has changed the percent cover by less than 20 percent, then you may record a less than 20 percent change.

F. Stage of development of shrubs. For each subplot, record a 1-digit code for the stage of development for each shrub species. Field crews should update OCC 2 codes if necessary but the OCC 3 code should be compatible with the OCC 2 code. For example, a shrub species coded overmature at OCC 2 could not be immature at OCC 3, unless real change occurred. Code as one of the following:

Code	Stage of Development
1	immature, no dead material
2	mature, 1-24% dead material
3	overmature, 25 percent or more dead material

G. Percent cover of "all shrubs" and "all herbs." Record the total percent cover on the measured portion of the 5-meter fixed-radius of all shrubs and record the total percent cover on the measured portion of the 5-meter fixed-radius of all herbs. Record percent cover to the nearest 5% using a 2-digit code. Estimate percent cover as the portion of the fixed-radius subplot that would be obscured by all shrub species/all herb species if viewed from directly above. Record total crown closure as "99".

Total percent cover within a plant group (shrubs or herbs) cannot exceed 100 percent. Total percent cover within a plant group cannot exceed the total sum of all individual species in both canopy layers of the plant group. However, total percent cover within a plant group can be, and often is, less than the sum of all individual species within a plant group. This happens because of overlap between layers or when you have several species with 3% percent cover which get coded individually as 5% percent cover.

H. Heights of canopy layers. There can be 2 canopy layers for each plant group (tree seedlings, shrubs, herbs). Record height of the canopy layer as a 3-digit code to the nearest decimeter for each layer within each plant group. Layer 1 is the taller layer within each plant group, layer 2 the shorter layer within each plant group. For instance, layer 1 height for shrubs would be the average of the taller shrubs on the fixed-radius and layer 2 height for shrubs would be the average of shorter shrubs on the fixed-radius. If there is only one layer in the plant group, record the height in layer 1. As the plot is completed the heights of the layers for each plant group can be adjusted to represent the average over the area sampled.

Determine if there are one or two layers of the plant group in the plot area. To be "distinct" layers:

Heights of tree seedling layers must differ by at least 1 meter

Heights of shrub canopy layers must differ by at least 1 meter

Heights of herb canopy layers must differ by at least 5 decimeters

I. Seedling Count

Count a seedling if it is 15 cm tall. Count all live seedlings regardless of damage or closeness but count only 1 seeding from a clump (and a clump is 3 or more from a common root base). Note: The selection criteria is different for seedling count than the selection criteria for seedling on the trackable tree tally (page 148).

Pacific Yew seedling count.

On the 3.3 meter fixed-radius, record all the number of Pacific Yew sprouts present (Code 230) and all the number of Pacific Yew seedlings present (Code 231). The Husky will ask specifically for this information on each fixed-radius. Sprouts are vegetative reproduction and seedlings are sexual reproduction. Sprouts will be growing from stumps or decaying stems; seedlings will be growing out of soil.

A drug, taxol, that occurs in the bark, needles, roots, and wood of Pacific Yew has proven effective in treating several forms of cancer. The technology for extracting taxol from needles has not been prefected, and almost all of the taxol that has been used to date has been produced from bark stripped from trees.

Seedling count--species other than Pacific Yew. Record the number of seedlings of each tree species present on the 3.3 fixed-radius. Record up to 10 seedlings of each species present. For many species this information may have little use now. It is being collected to catalog the total number of species present.

VI. SUBPLOT ATTRIBUTES

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VI. SUBPLOT ATTRIBUTES

REQUIRED TALLY FOR SECTIONS I and II ON THE SUBPLOT ATTRIBUTE RECORD

If the condition class of the subplot has a sample kind of 9, only condition class number and condition class percentages will be filled out in Sections I and II of the Subplot Attribute Record. If the condition class of the subplot has a sample kind of 1, 5, or 6 use the table below:

Subplot Number	Required Subplot Attributes (by Section)
##	I, II
R#	none
C#	I, II
N#	I, II
P#	I, II

A. SECTION I.

1) Subplot number. Record a 2-digit number for each subplot. (See page 45)

Whenever a new subplot is established in condition class 1 to replace a point that was moved at OCC 2, the OCC 2 point will be remeasured. These R# subplots do not require subplot attributes.

2) Physioclass information. Subplot-level information on slope and aspect describes the 17-m fixed-radius circle around each subplot center. Slope and aspect are important variables for explaining variations in species composition of plant communities. Subplot-level information is also helpful in determining plot averages. Codes for OCC 2 will be downloaded on the Husky, and updated by field crews when significant differences occur. Physioclass information for new subplots will be recorded.

a) Aspect. Record a 2-digit code for each subplot as follows. For condition classes with N, S, E, W, and F aspects; leave the second digit blank. If aspect = "F", slope = "0".

Code	Azimuth
N-	338 - 22
NE	23 - 67
E-	68 - 112
SE	113 - 157
S-	158 - 202
SW	203 - 247
W-	248 - 292
NW	293 - 337
F-	Flat

b) Slope. Record a 2-digit code indicating the percent slope of each subplot. You may record the exact slope or round to nearest 5%.

c) Topographic Position. Record a 1-digit code for topographic position for each subplot.

Code	Slope Shape	Topographic Position
1	Flat	Ridgetop or mountain peak over 40 meters
2	Convex	Narrow ridgetop or peak less than 40 meters wide.
3	Convex	Sidehill -- upper 1/3
4	No rounding	Sidehill -- middle 1/3
5	Concave	Sidehill -- lower 1/3
6	Concave	Canyon bottom less than 200 meters wide
7	Flat	Bench, terrace or dry flat
8	Flat	Broad alluvial flat over 200 meters wide
9	Flat	Swamp or wet flat

3) Stream class. Record a 1-digit code describing the stream class of the area within 65 meters of the subplot center. Information on streams is used for identifying forest land that is within the riparian zone.

Code	Stream Class
1	Perennial Streams - Streams that flow throughout most of the year (except for infrequent and extended periods of drought); include lakes.
2	Intermittent Streams - Streams or part of stream that flows only part time because it receives water from seasonal sources such as springs and bank storage as well as precipitation. This does not include ephemeral streams, which flow only briefly in direct response to precipitation.
0	No streams or lakes

4) Stream Proximity. Record a 2-digit code indicating the horizontal distance in meters from the stream to each subplot center up to 65m away. Record 00 if there is no stream within 65 m horizontal distance from the subplot center. Allowable codes are 00 thru 65.

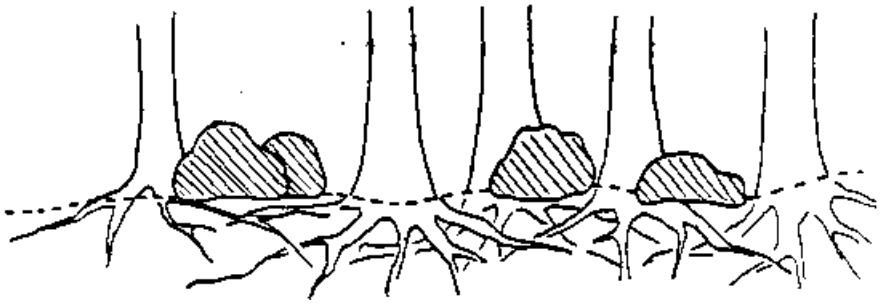
B. SECTION II.

1) Nonstockable area & nonforest inclusions--17m fixed-radius plot. Complete for all subplots which are at least in part timberland, low productivity forest or oak-woodland on the 11k grid. At each subplot calculate the percent reduction of plot area by rockiness, wetness, soil conditions and nonforest inclusions within the 17-m fixed-radius circle. Remember that a 25% cover of rocks does not necessarily reduce tree stocking by 25% and that not all nonstockable areas "meet the eye" (see diagrams below). Judge the impact of rockiness, wetness, and soil conditions based on how they would affect a fully stocked stand at maturity. Keep in mind that a fully stocked, mature Douglas-fir stand is more dense than a fully-stocked stand of Oregon white oak. Also, a boulder may reduce the stocking of seedlings but will have no effect on the stocking of a mature stand.

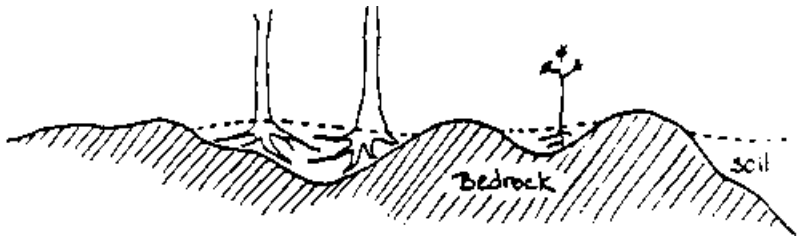
Nonstockable implies conditions that, when present within the 17-meter fixed-radius plot, permanently impair achieving full (normal) tree stocking. These conditions include the presence of standing or running water, a high water table, rock or shallow soil over rock, severe soil compaction (e.g. an old landing), mass soil movement (slips, slides, or slumps), and nonforest inclusions.

Nonforest inclusions: Areas that are actually nonforest but are too small by definition (<35 meters wide or <.4 hectares) to qualify as a different condition class on the subplot are called nonforest inclusions and are treated as nonstockable. A road or a stream which qualify as a different condition class are not to be treated as nonstockable areas. It may only be treated as nonstockable if it is too small to qualify as nonforest.

Recording nonstockable areas. Map the nonstockable area or nonforest inclusion on the 17 m subplot diagram and record the kind of nonstockable area and percentage on the diagram under "Nonstockable %". Only map nonstockable conditions and nonforest inclusions which will reduce stockability and map both below and above ground conditions that reduce stockability. Base the percent cover estimate on the nonstockable area diagram and record the estimate to the nearest 5 percent on both the subplot diagram and the Subplot Attribute Record. See bottom of page 129 for estimating percentages. For wildlife habitat assessment purposes, make note on the diagram, and in the area attribute record, of nonstockable areas consisting of talus/scree, rock outcrops, and cliffs. In addition, note the kind of nonstockable area (including nonforest inclusions) by subplot number in "PRESENT CONDITION/PAST DISTURBANCE" on the Plot Record.

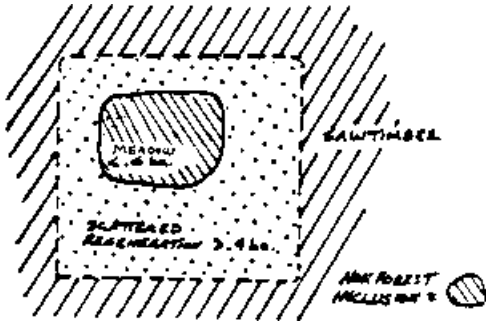


Example: Large, scattered boulders cover 25% of the 17 m fixed-radius subplot. However, tree roots can fully utilize the space beneath the boulders. The boulders thus have no effect on tree stocking, and the item is coded "00" and the rocks are not mapped on the 17 m subplot diagram.

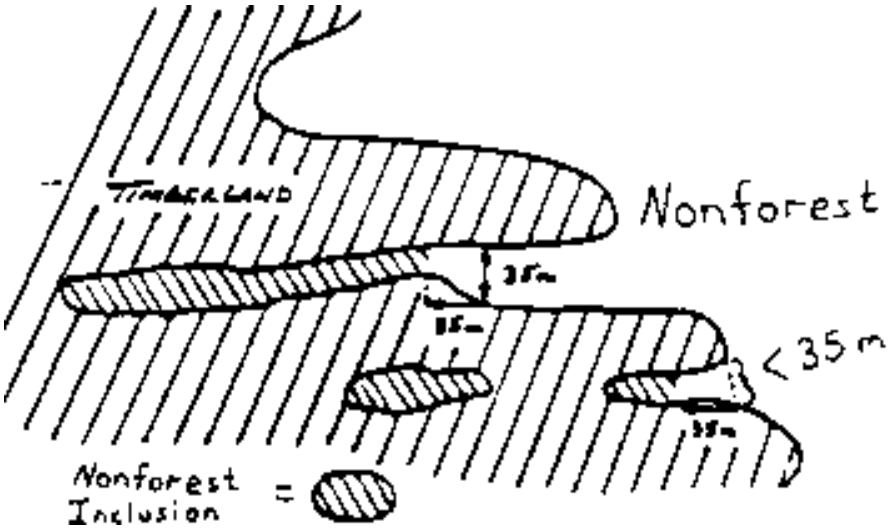


Example: Bedrock outcroppings cover 25% of the 17 m fixed-radius subplot. However, because of shallow soil conditions, tree stocking is reduced by about 50%. This item is therefore coded "50" and both the above and below ground condition that is affecting stockability should be mapped on the subplot diagram.

BLANK PAGE



Example: A meadow that is less than <.4 hectare surrounded by scattered regeneration which is greater than >.4 hectare would be a nonforest inclusion and mapped as a nonstockable area on the subplot diagram.



Example: In the above example the nonforest stringer is classified as timberland because it is not 35 m wide. Therefore that part of the nonforest stringer is a nonforest inclusion and would be mapped as a nonstockable area. The nonforest neck is classified as nonforest because it is less than 35 meters long and connected to a nonforest area that is at least 35 meters wide and .4 hectare in size. Since it is a different condition class it would not be mapped as nonstockable area.

2) Root disease (17-meter fixed-radius subplot). 2-digit code recorded on all subplots which are at least in part timberland, low productivity forest or oak-woodland on the 11k grid.

Root diseases, especially laminated root rot, are serious pests of conifers in California. However, reliable estimates of the extent of area affected are unavailable. The purpose of this root disease assessment is to determine the amount of area affected by root disease. The results will be used to estimate the impact of root disease on California's timber resources.

How to define and map root disease infected subplot. Assess root disease for a 17-meter fixed radius subplot. On each subplot, estimate the location and dimensions of root disease by using a compass and pacing or measuring distances. Do include areas that are conifer sites but that are not currently supporting conifers due to the presence of root disease. Sketch the infection center boundaries on the subplot mapping record; shade in the infected areas, and label with the appropriate code. More than one disease can occur on a 17-meter fixed radius subplot. The disease codes are as follows:

Code	Causal fungus	Disease
PW	Phellinus weirii	laminated root rot
CW	Ceratocystis wagneri	black stain root disease (do not map)
FA	Fomes annosus	annosus root rot
AM	Armillaria ostoyae(mellea)	armillaria root disease
UK	unknown	--
NO	none present	--

If you find evidence of root disease, but cannot identify the disease, enter "unknown" for the disease code.

Map and estimate percent cover only for those diseases that are primary causes of tree death. Do not map secondary infections (e.g. Armillaria that invaded a tree that was killed by Phellinus). If you find evidence of a secondary disease, note the situation on the root disease plot card for that subplot.

Define the boundary of an infection center using straight lines connecting the inner bole faces of healthy-appearing trees on the margin of the root disease center. A healthy-appearing tree is defined as follows:

(1) lacks crown symptoms of root disease (reduced terminal growth increment, thin or yellow crown, distress cone crop);

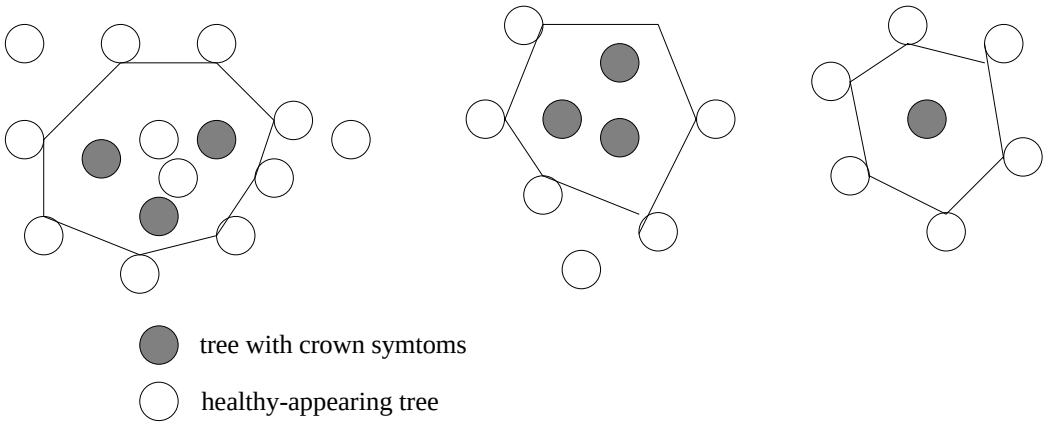
(2) has a root disease-infected tree as nearest neighbor on side toward infection center;

(3) has a healthy tree as nearest neighbor on side away from the infection center.

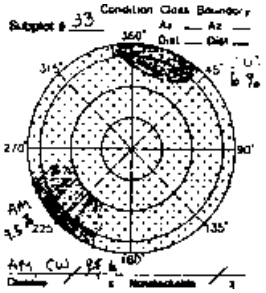
When defining the boundary, do not consider islands of healthy-appearing trees inside an infection center, as these trees are likely to be infected. The following diagram shows how infection center boundaries would be defined in several situations.

See next page for examples.

Examples



Estimating and recording percent cover of root disease. For each root disease present on the plot, estimate the percentage of the 17-meter fixed radius plot that is infected by the particular root rot. Base estimates on the 17 m subplot diagram and record both the disease code and percentage on the subplot diagram and the Subplot Attribute Record. Each dark dot represents 0.22% of the circle. (See page 129, "Recording condition class percentages" for estimating percentages.) If no root disease is present, enter "00" on the Subplot Attribute Record and "None" under "Disease" on the subplot diagram.



Mapping nonstockable area and root disease on the subplot diagram. When mapping root disease infection centers, do not include areas that are nonstockable (these areas will not support susceptible host species).

GUIDE FOR IDENTIFYING MAJOR ROOT DISEASES

General Root Disease Symptoms:

Root disease centers or "pockets" usually appear as patches or groups of dead and dying trees. Trees in all stages of decline (old dead, recent kills, declining) are usually present; old dead trees are found at the center of the pocket, while declining trees occur near the leading edge of the expanding diseased plot (in contrast, bark beetle patch kills usually consist of trees that died suddenly and simultaneous with each other). Windthrown trees with decayed roots broken off close to the root collar (root ball) may be evident, except for Black stain root disease, which does not form root balls. Individual trees affected by root disease may exhibit the following above-ground symptoms:

a.) Reduced height growth increment (as compared to neighboring healthy trees). This results from gradual decline as the root system is slowly destroyed. Look for progressively short internodes of the terminal leader.

b.) Sparse, yellow crowns. Trees infected by root disease fungi often lose needles; needles that remain are often yellow.

c.) Distress cone crop. In the later stages of decline, infected trees may produce an abundant crop of unusually small cones.

Individual Disease Descriptions:

Laminated Root Rot: Affects all conifers; most commonly Douglas-fir, true-fir, and hemlock. Windthrown trees have decayed roots broken close to root collar, forming root balls. When duff and soil are removed to expose roots, look for grey-white mycelium on surface of roots--(Armillaria will have white mycelium on the inside of roots, between the bark and wood). The mycelium penetrates only the outermost few millimeters of bark, forming a crusty sheath that cannot be rubbed off easily.

Laminated root rot is most easily identified by examining decayed wood which can be found on root balls or in stump hollows. Decayed wood separates readily along annual tree growth rings, hence the name "laminated" root rot. Yellowish-brown decayed wood is usually dry and contains numerous 1 millimeter-long oval pits. Reddish-brown wiry whiskers can usually be found between layers of decayed wood (these are best seen with a 10 x magnifying lens).

Armillaria Root Disease: Affects all conifers and hardwoods. Root balls on fallen trees occur in disease centers. Heavy resin flow near base of tree is common. Chopping into root collar or root will reveal white, fan-shaped mats of mycelium between wood and bark. The mats have a texture that may remind one of peeling partially-dry laytex paint off a glass surface (if one has ever done that). The mycelium can penetrate a few millimeters into the inner bark, but never evident on the outside of the bark or root surfaces (laminated root rot has grey-white mycelium on the outside). Decay in root balls and stumps is soft, spongy, yellowish, stringy, and often contains numerous black lines.

Black Stain Root Disease: The primary host is Douglas-fir, but it can affect hemlock and pines. Infected trees occasionally have resin flow at the base, but not always. Brown to black streaks in the sapwood (usually in the last 3 to 4 annual rings) of the root collar and roots are the best indication of the disease. You must chop into the wood to diagnose Black stain, it does not occur in or on the bark of bole or roots. Root balls are not present in Black stain disease centers (unless other root disease is present), because the fungus does not rot roots--it plugs sapwood tracheids causing trees to die standing.

Annosus Root Disease: Most common on true-fir, pine, and hemlock. Most difficult to identify of the major root diseases. Root balls may be present in disease centers, particularly in true-fir stands. Decay is soft, spongy, white (often with silvery cast) with black flecks (like small wild rice grains scattered through the decay). Small bracket-shaped conks may be present in stump hollows or under duff near root collar of infected dead trees or stumps. Annosus is often identified by default--if it is not one of the other root diseases, and if the symptoms suggest root disease and the decay is similar to the description, then it is probably Annosus.

3) Mapping and recording condition classes

Condition class percentages will be recorded for all classified and established subplots. When a subplot is entirely in one condition class record 99% in "% in condition class" on the Subplot Attribute Record under the appropriate subplot number and under the appropriate condition class number.

a) Mapping condition classes. Where a subplot has more than one condition class, the condition class boundaries will be drawn on the 17 m subplot diagram. The field crew will map the condition class boundary so that it can be replicated by a check plotter and/or the Occasion 4 crew.

The subplot diagram is designed to aid mapping. The concentric circles represent 5m, 10m, 15m, and 17m, respectively, from the subplot center. The dark dot interval represents 2 meters, the light dot interval represents 1 meter. The field crew will record the perpendicular distance and azimuth from subplot center to the condition class boundary on the 17 m subplot diagram (See example 1 on following page). Note that on the subplot diagram two azimuths and distances can be recorded. If there are two condition class boundaries, map and record azimuths and distances to both, labelling the azimuths and distances with the condition class number (See example 2 on following page). If there is only one condition class but the boundary is not straight, record two azimuths and perpendicular distances to the boundary and mark the two points on the curved boundary (See example 3 on following page).

b) Recording condition class percentages. Where a subplot has only one condition class record 99% on the appropriate condition class line on the Subplot Attribute Record and record 0% in the remaining condition classes. Where a subplot has more than one condition class, record the percent of the subplot in each condition class. It is unlikely that a subplot will have more than two condition classes, but if it does, make sure that "% in condition class" is recorded on the correct condition class line and that the percentages sum to 100% for each subplot center.

On subplots with more than one condition class, use the 17 m subplot diagram to estimate percent of the subplot in each condition class in the following way:

a) Each dark dot represents 0.22% of the 17-m plot.

b) Draw the condition class boundary and count the number of dark dots within the boundary. Count every other dark dot of those which fall directly on a boundary.

c) Multiply the number of dark dots from (b) by 0.22% to get percent of the subplot in that condition class. Alternatively, count the number of dark dots from (b); divide by 454 (total number of dark dots in a circle) and multiply by 100 to get the percent of the subplot in that condition class. (See the legend on the diagram plot card.)

CALIFORNIA

CONDITION CLASS MAP
NONSTOCKABLE MAP
ROOT ROT MAP

COUNTY_____ PLOT _____

DISEASE CODES

PW = PHELLINUS (LAMINATED)
CW = BLACK STAIN (DO NOT MAP)
AM = ARMILLARIA
FA = FOMES ANNOSUS
UK = UNKNOWN
NO = NONE PRESENT

Calculate: % of plot area = $\frac{\text{\# of counted dark dots}}{4.54}$

100%	= 454 dark dots
50% (1/2)	= 227 dark dots
25% (1/4)	= 114 dark dots
12.5% (1/8)	= 57 dark dots
.22%	= 1 dark dot

Light dot interval = 1 meter
Concentric Circles: 5, 10, 15, AND 17 Meters

Example 1

Condition Class Boundary
Subplot # 11
Az 45 Az ___
Dist 10m Dist ___
Condition Class 2
360° 45° 90° 135° 180° 225° 270° 315°
Disease % Nonstockable %

Example 2

CC2 CC3
Condition Class Boundary
Subplot # 22
Az 360 Az 225
Dist 7m Dist 12m
Condition Class 2
Cond. Class 3
360° 45° 90° 135° 180° 225° 270° 315°
Disease % Nonstockable %

Example 3

Condition Class Boundary
Subplot # 33
Az 315 Az 290
Dist 11m Dist 10m
Condition Class 2
360° 45° 90° 135° 180° 225° 270° 315°
Disease % Nonstockable %

Condition Class Boundary
Subplot # ____
Az ___ Az ___
Dist ___ Dist ___
360° 45° 90° 135° 180° 225° 270° 315°
Disease % Nonstockable %

Condition Class Boundary
Subplot # ____
Az ___ Az ___
Dist ___ Dist ___
360° 45° 90° 135° 180° 225° 270° 315°
Disease % Nonstockable %

V. CONDITION CLASS ATTRIBUTES

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V. CONDITION CLASS ATTRIBUTES

REQUIRED TALLY FOR THE PLOT ATTRIBUTE RECORD

Sample Kind of the Condition Class	OCC 3 GLC of the Condition Class	Items needed
1	20,49, 44 on 11k grid	1-21, 22-24 for slivers
5	20,49, 44 on 11k grid	1-21
6	20,49, 44 on 11k grid	1-21; 25-26
9	41-43, 45-48, 63-92, 44 off 11k grid	1-12

A. Condition Class Identification Attributes (Items 1-10 on the Plot Attribute Record)

Identification variables will be required for each condition class sampled. (See the tally guide on previous page.) Many items have been printed by the computer; others need to be completed by the field crew.

Item 1--County. This 3-digit code, printed/downloaded by the computer, identifies the county the condition class is in. The county codes are listed below, along with the declinations to be used in the counties, and the reporting unit in which the county lies--(NC) North Coast, (NI) North Interior, (SA) Sacramento, (CC) Central Coast, (SJ) San Joaquin, and (SO) Southern.

CODE	COUNTY	DECL EAST	UNIT	CODE	COUNTY	DECL EAST	UNIT
001	Alameda	16	CC	053	Monterey	16	CC
003	Alpine	16	SJ	055	Napa	17	SA
005	Amador	16	SJ	057	Nevada	17	SA
007	Butte	17	SA	059	Orange	14	SO
009	Calaveras	16	SJ	061	Placer	17	SA
011	Colusa	17	SA	063	Plumas	17	SA
013	Contra Costa	16	CC	065	Riverside	14	SO
015	Del Norte	18	NC	067	Sacramento	16	SA
017	El Dorado	16	SA	069	San Benito	16	CC
019	Fresno	15	SJ	071	San Bernardino	14	SO
021	Glenn	17	SA	073	San Diego	14	SO
023	Humboldt	18	NC	075	San Francisco	16	CC
025	Imperial	13	SO	077	San Joaquin	16	SJ
027	Inyo	15	SO	079	San Luis Obispo	15	CC
029	Kern	15	SJ	081	San Mateo	16	CC
031	Kings	15	SJ	083	Santa Barbara	15	CC
033	Lake	17	SA	085	Santa Clara	15	CC
035	Lassen	17	NI	087	Santa Cruz	16	CC
037	Los Angeles	14	SO	089	Shasta	17	NI
039	Madera	16	SJ	091	Sierra	17	SA
041	Marin	16	CC	093	Siskiyou	18	NI
043	Mariposa	16	SJ	095	Solano	16	CC
045	Mendocino	17	NC	097	Sonoma	17	NC
047	Merced	16	SJ	099	Stanislaus	16	SJ
049	Modoc	18	NI	101	Sutter	16	SA
051	Mono	16	SJ	103	Tehama	17	SA
				105	Trinity	18	NI
				107	Tulare	15	SJ
				109	Tuolumne	16	SJ
				111	Ventura	15	CC
				113	Yolo	17	SA
				115	Yuba	17	SA

Item 2--Plot number. 3-digit code downloaded by the computer.

Item 3--Sample kind. 1-digit code, printed/downloaded by the computer for condition class 1. Sample kind will be entered in the field for each new condition class encountered. The sample kind indicates whether the condition class covers measured forestland, or is in an area used only for identification of ground class, or is in an area with denied access, or is out of the inventory. Downloaded sample kind tells the field crew whether or not the plot was previously established. Use the following rules for assigning a SK to each condition class.

CODE	SAMPLE KIND	DESCRIPTION OF CONDITION CLASS
1	Measured forestland	Timberland (GLC 20), low productivity forest (GLC 49) or oak woodland (GLC 44) on the 11k grid.
5	Access-denied no harvest	Access-denied measured forestland that has not been harvested since OCC 2.
6	Access-denied harvested	Access-denied measured forestland that has been harvested since OCC 2.
9	Nonforest and unmeasured forestland	Ground land classes of 41-43, 45-48, oak-woodland (44) not on the 11k grid, or 63-92.
0	Outside the inventory	National Forest, Reserve, Census Water, access-denied projected oak-woodland on the 11k grid subplots which are not in condition class 1, or access-denied substituted plots where no photo point qualifies for substitution.

The office has assigned sample kind to condition class 1. You should accept the office-assigned sample kind for condition class 1 UNLESS you encounter one of the following situations. If you encounter one of these situations, update the sample kind, describe on the Plot Record the reason for the change, and indicate the change in the "Contact Office About" section of the Plot Record.

(1) Subplot 1 with an office-assigned sample kind of 1 is found to be GLC 41-43, 45-48, 63-92 or GLC 44 not on the 11k grid. This may result either from misclassification at OCC 2, new rules interpretation (e.g. falls on cutbank), or land conversion from forest to nonforest. The SK for condition class 1 will be 9.

(2) An office-assigned SK 9 subplot 1 has become forested (GLC 20) since OCC 2. SK for condition class 1 will be 1.

(3) Access has been denied to the plot. The sample kind of condition class 1 on an access-denied plot can be 5, 6, 9 or 0 (see above).

(4) If a subplot, or part of a subplot, is found to be outside of the sample area, the sample kind of the condition class will be 0.

Item 4--Owner class. 3-digit code, printed by computer. The code indicates the broad ownership class of the condition class. Ownership data were collected in the county courthouse prior to field data collection for subplot 1. The data are used in compiling forest statistics. If evidence indicates the printed/downloaded owner class is incorrect for any condition class, write "YES" in "DOES CURRENT OWNER CLASS DIFFER FROM OCC 2 OWNER CLASS?" on the Plot Record and note the source of information, the updated owner class and the condition class the update is associated with in the space below on the Plot Record. If possible record the date of the ownership change in "IF YES, DATE OF CHANGE". Note that a change of owner does not necessarily denote a change in ownership class. In addition, ownership class boundaries do not ,in and of themselves, indicate a different condition class (except in the case of National Forest and Reserved Areas). Thus, individual subplots may fall into different ownership classes but be in the same condition class. Ownership lines should be mapped on the plot layout on the Plot Record. Codes on next page.

OWNERSHIP CODES

	Owner	Code
A.	Public Owners	
	1a. National Forests	500 (Region 5)
	Angeles National Forest	501
	Cleveland National Forest	502
	Eldorado National Forest	503
	Inyo National Forest	504
	Klamath National Forest	505
	Lassen National Forest	506
	Los Padres National Forest	507
	Mendocino National Forest	508
	Modoc National Forest	509
	Plumas National Forest	511
	San Bernardino National Forest	512
	Sequoia National Forest	513
	Shasta-Trinity National Forest	514
	Sierra National Forest	515
	Six Rivers National Forest	510
	Stanislaus National Forest	516
	Tahoe National Forest	517
	Lake Tahoe Basin Management Unit	519
	1b. National Forests	400 (Region 4)
	Toiyabe National Forest	417
	1c. National Forests	600 (Region 6)
	Rogue River	610
	Siskiyou	611
	2. Other Public	
	a. Other Federal--reserved	7
	b. Bureau of Land Management--reserved	10
	c. Bureau of Land Management--available	12
	d. Other Federal--available	14
	e. State--available	15
	f. County and Municipal--available	16
	g. State--reserved	18
	h. County and Municipal--reserved	19
	i. Census Water	98
	3. Indian, Tribal Lands	800
B.	Forest Industry	
	a. Forest Industry with mills	21
	b. Forest Industry without mills	71
C.	Farmer and Miscellaneous Private	
	a. Private--reserved	8
	b. Native American--reserved	9
	c. Farmer owned	40
	d. Miscellaneous Private--available	60

Ownership class definitions:

A. Available land--Land not withdrawn from timber production.

B. Bureau of Land Management lands: Lands administered by the BLM

C. County and Municipal lands: Lands owned by county or other local agencies.

D. Farmer-owned lands: Lands owned by individuals or companies that operate farms and do not meet the definition of forest industry. Farms are tracts of land used for the production of commercial crops of food or other agricultural products.

E. Forest Industry lands:
   a. With mills--lands owned by companies or individuals operating wood-using plants.
   b. Without mills--lands owned by companies that manage forests for timber production but do not operate mills.

F. Miscellaneous Private Lands--Private lands not qualifying as either forest industry lands or farmer-owned lands

G. Native American lands: Tribal lands held in fee by the Federal Government but administered for Indian tribal groups, and Indian trust allotments.

H. National Forest Lands--Lands administered by the Forest Service. Lands in one National Forest which are administered by another National Forest are given the ownership code of the National Forest being administered.

I. Other Federal Lands--Lands administered by U.S. Government agencies other that the BLM and the Forest Service.

J. Reserved Lands--Lands withdrawn from forest management by statute, ordinance or agency policy. Includes National, State, County and municipal parks, BLM reserved, Native American reserved and land owned by The Nature Conservancy.

K. State Lands--Lands administered by the State of California.

Item 5--Date of OCC 3 inventory. Record a 4-digit code for condition class 1. The first 2 digits refer to the month, the second 2 digits refer to the year.

** EXAMPLE: June 1991
would be coded "0691".

Item 6--Date of OCC 2 inventory. 4-digit code printed/downloaded by computer under condition class 1. Indicates the month and year of the OCC 2 inventory and uses the same codes as Item 5.

Item 7--OCC 3 ground land class. 2-digit code that describes the ground land class (GLC) of the condition class.

GLC codes. The GLC codes are as follows:

Code	Ground land class
20	Timberland
41	Other forest, rocky
42	Subalpine or coastal conifer scrub
43	Pinyon-Juniper
44	Oak-woodland
45	Chaparral
47	Wetland
48	Cypress
49	Other forest, low productivity.
	Nonforest
63	Natural rangeland, nonforest marsh, pasture, or abandoned farmland.
64	Other farmland including croplands, farmsteads etc.
66	Cultural nonforest stringers - constructed roads, powerlines, pipelines, and railroads.
67 I	Urban - townsites and plots of clustered suburbs, residential industrial buildings, city streets, developed parks. (Undeveloped forest land in parcels .4 ha and larger is classified as forest land.).
68	Naturally nonvegetated - barren rock, sand, and glaciers.
69	Christmas tree lands, nurseries
92	Water - includes lakes .4-16 ha and streams 35-200 meters wide.

Condition class 1 OCC 3 GLC is the same as the OCC 2 GLC unless a real GLC change occurred on the ground at subplot 1 since OCC 2. If either OCC 3 GLC or OCC 2 GLC for condition class 1 are changed in the field, note on the Plot Record in "CONTACT OFFICE ABOUT" and submit to lead analyst for review.

LAND CLASS DEFINITIONS

Nonforest (code 63-69 92) - Land not qualifying as forest land. Includes land that has never supported forest growth, and land once forest land but now developed for nonforest use such as crops, pasture, residential areas, highways, airstrips, etc. Areas of water 0.4 hectares to less than 16 hectares in size or 10 meters to less than 200 meters in width will also be classified as nonforest. Census water, areas of water larger than these, is excluded from the gross area of the inventory unit. Christmas tree farms are classed as nonforest.

Forest Land - Land that is, or has been, at least l0-percent stocked by trees, and is not developed for nonforest use. 10-percent stocking is equated with 10-percent crown cover or 10-percent of normal yield table values.

Land may be developed for nonforest use even though tree cover is present. Indications of nonforest use may include the presence of fences or structures, the clearing of stumps, heavy grazing, the absence of forest vegetation, evidence of human habitation and use around maintained structures such as landscaping, gardens, lawns, and play areas. The absence of forest vegetation means that some or all layers of the vegetation present--trees, shrubs and forbs--differ from what one would expect on forest land undisturbed by nonforest use; for example, a fenced, farm-lot may have forest trees present, but the shrub and forb communities are altered by grazing. In California, grazing is common on forest lands and is not ordinarily reason to classify a plot as "developed for nonforest use".

Land that is, or was formerly, at least 10-percent stocked with trees on which urban development is imminent is still forest land; for example, if a plot location falls in a forested tract of several undeveloped lots in a subdivision and the tract meets minimum area, width and length requirements, the plot is forest land.

A tree is defined as a woody plant that has an erect perennial stem or trunk at maturity that is at least 7.5 cm in diameter at breast height (1.37 meters) and a total height of at least 4 meters. (Ag. Handbook No. 541, 1979, ed., p. 3).

Timberland (codes 20) - Forest land which is potentially capable of producing at least 1.4 cubic meters/hectares/year (20 cubic feet/acre/year) of continuous crops of trees to industrial roundwood size and quality and which is not withdrawn from timber utilization. Industrial roundwood requires species that grow to size and quality adequate to produce lumber and other manufactured products (exclude fenceposts and fuelwood which are not considered manufactured). Timberland is characterized by no severe limitations on artificial or natural restocking with species capable of producing industrial roundwood.

Other Forest Land (codes 40) - Forest land incapable of potentially producing at least 1.4 cubic meters/hectare/year in continuous crops of industrial roundwood because of species and/or adverse site conditions such as sterile soils, moisture stress, poor drainage, harsh environments, or rockiness.

Rocky (code 41) - Other forest land which can produce tree species of industrial roundwood size and quality, but which is unmanageable because the site is steep, hazardous, and rocky, or is predominantly nonstockable rock or bedrock, with trees growing in cracks and pockets. Other forest-rocky sites may be incapable of growing continuous crops due to inability to obtain adequate regeneration success.

Subalpine or Conifer Scrub (code 42) - Extreme climatic and soil conditions prevent species from reaching industrial roundwood quality. Whitebark pine in the high Sierra and shore pine along the sparkling blue Pacific are examples, as well as Monterey pine, Bishop pine, and D. fir on the coast. Trees in these areas are often characterized by extremely slow growth or deformities.

Pinyon-Juniper (code 43) - Stocking capability indicated by live trees or stumps and snags less than 25 years dead or cut. Areas currently capable of 10 percent or more stocking with forest trees with juniper species predominating. These areas are not now, and show no evidence of ever having been, 10 percent or more stocked with trees of industrial roundwood form and quality. 10 percent juniper cover means 10 percent crown cover.

Oak-woodland (code 44) - Areas currently 10 percent or more stocked with forest trees, with low quality forest trees of oak, digger pine, madrone, or other hardwood species predominating, and which are not now, and show no evidence of ever having been, 10 percent or more stocked with trees of industrial roundwood form and quality. Trees on these sites are usually short, slow growing, gnarled, poorly formed, and generally suitable only for fuelwood. The following types include: blue oak, white oak, live oak, oak-digger pine.

Chaparral (code 45) - Areas covered with heavily branched dwarfed trees or shrubs, usually evergreen, the crown canopy of which currently covers greater than 10 percent of the ground. The principal species are dwarf Quercus, Cercocarpus, Garrya, Ceanothus, Arctostaphylos, Baccharis, and Adenostoma. Areas in which the predominate cover is Artemisia, Purshia, Gutierrezia, Opuntia, or semi-desert species are considered nonforest.

Wetland (code 47) This type may include both hardwood and conifer communities. Included are sitka spruce and dense shrubs bordering tidal flat plots and channels along the coast, where area currently has 10 percent cover of trees. These tidal flat areas also contain willow and cottonwood. Cedar and alder swamps may also contain sitka spruce, lodgepole pine, white pine and hemlock. They are characterized by a high water table or even standing water for all or a portion of the year. Areas that are mainly tree covered, but have areas of thin tree stocking filled with brush are classed as forest.

Cypress (code 48) - Forest land with forest trees with cypress predominating. Shows no evidence of having had 10 percent or more cover of trees of industrial roundwood quality and species.

Low productivity (code 49)--Forest land capable of growing crops of trees to industrial roundwood quality, but not able to grow wood at the rate of 1.4 cubic meters/hectare/year. Included are areas of low stocking potential and/or very low site index.

Item 8--11K grid. 1-digit code for condition class 1 that describes whether a field plot was on the 11K grid at OCC 2. Oak woodland points--GLC 44--are only established when they fall on the 11-K grid.

Code "Y" for yes.
Code "N" for no.

Item 9--OCC 2 ground land class. 2-digit code for condition class 1 printed by the computer, using the same codes as in Item 7. This is the ground land class of condition class 1 at OCC 2. If there is disagreement with the OCC 2 GLC classification for condition class 1, code Y in "OCC 2 GLC UPDATED?" and note the reason in "IF Yes, Explain" on the Plot Record. On condition classes other than 1, enter OCC 2 GLC based on ground observation and photos. If different than OCC 3 for that condition class, note reason in "CONTACT OFFICE ABOUT" on the Plot Record.

Item 10--OCC 2 PI. 2-digit code printed by the computer. This is the classification made by the photo interpreter at Occasion 2 and is not a field entered item.

OCC 2 Stratum Codes

Timberland

21	Conifer volume 0-75 cubic meters/hectare. Includes mixed up messes, clearcuts, burns, brushfields.
22	All hardwood stands growing industrial size and quality roundwood with less than 10 percent conifer sawtimber crown closure.
23	Conifer volume 0-75 cubic meters/hectare. Obviously well-stocked stands of seedlings, saplings, or small poletimber conifer trees; obviously well stocked is 40 percent+ crown closure or evenly spaced stocking of small trees which will be 40 percent+ crown closure when they reach 17.5 cm.
24	Conifer volume 76-150 cubic meters/hectare.
25	Conifer volume 151-300 cubic meters/hectare.
26	Conifer volume 301-500 cubic meters/hectare.
27	Conifer volume 501+ cubic meters/hectare.

Other Forest Land

41	Rocky.
42	Subalpine or conifer scrub.
43	Pinyon-juniper.
44	Other forest oak--other hardwood.
45	Chaparral--10 to 49 percent cover.
46	Chaparral--50 percent or more cover.
47	Wetland, woodland, and bogs.
48	Cypress.
49	Low productivity.

Nonforest

61	Cropland.
62	Improved pasture.
63	Natural rangeland or abandoned farmland.
64	Other farmland including farmsteads.
65	Marsh.
66	Manmade nonforest stringers - 5 meters wide and wider constructed roads, powerlines, pipelines, canals, and railroads.
67	Urban - townsites and areas of clustered suburbs, residential and industrial buildings. (Forest .4 hectare or more in urban areas are classed as forest land. Zone codes are used to identify urban densities).
68	Nonvegetated - less than 10 percent vegetation - rock, sand, glaciers, streams 10 meters to 34 meters wide.
69	Christmas tree lands, nurseries.
92	Water - includes lakes .4 - 16 hectares and streams 35 meters - 200 meters wide.

B. Condition Class Classification Attributes (Items 11-26 on the Plot Attribute Record)

Recording classification items. The classification items are recorded on the Plot Attribute Record for each condition class sampled. Refer to the tally guide above to determine which classification items to complete.

Item 11--Precipitation. 3-digit code printed under condition class 1 which shows average annual precipitation in centimeters. Do not change the printed code.

Item 12--Elevation. 3-digit code printed under condition class 1 which shows the plot's elevation to the nearest decameter. Do not change the printed code. The plot's elevation is determined by direct inspection of the USGS quadrangle maps. Information on elevation is useful for describing an area's stockability and its potential use as wildlife habitat.

Item 13--Condition class aspect. 2-digit code. Refer to the aspects recorded for subplots to help you determine a condition class average. Use the same coding system. If the aspect is equally SE, S, SW, code the aspect S. If the aspect is SE, S, SW, but 80 percent of the condition class is SE; code the aspect SE. For timberland plots, code the aspect which would most affect timber management.

Item 14--Condition class slope. 2-digit code. Refer to the slope recorded for individual subplots to help determine a condition class average. Use the same coding system. If the slope changes gradually from 20 to 60 percent, average the individual subplot slope percents. If slope ranges from 20 to 60 percent, but most of the condition class is on the steeper slope, code the steeper slope.

Item 15--Soil depth. 1-digit code. Code this item "1" when more than 1/2 of the subplots in the condition class have shallow soil.

CODE	SOIL DEPTH
1	Less than 50 cm
2	50 cm or greater

Item 16--Kind of disturbance since OCC 2. Record a 1-digit code describing disturbance since the OCC 2 inventory for each condition class. "Disturbance" is defined as the harvest of tallied trees >12.4, or the killing of trees by wildfire. Apply the following logic:

Code for disturbance only if one or more trees tallied (or reconstructed) live at OCC 2 with an OCC 2 dbh >12.4 cm are coded with a TH 8 or killed by wildfire at OCC 3.

CODE	KIND OF DISTURBANCE
0	No disturbance
1	Clearcut harvest
2	Partial harvest--heavy (20% removed)
3	Partial harvest--light (less than 20% removed)
6	Wildfire

Definitions:

In a clearcut harvest, residual trees of all sizes now comprise <25% crown cover. The residual trees usually include cull trees and less commercially desirable hardwoods.

In a partial harvest--heavy, remaining trees comprise at least 25% crown cover and 20% or more of the manageable stand was removed.

In a partial harvest--light, remaining trees comprise at least 25% crown cover and less than 20 % of the manageable stand was removed. In these types of harvests the residual stand usually consists of commercially desirable trees. In seed tree and shelterwood cuts, which are included in these categories, the residual trees are conifers that were left to regenerate a new stand.

Wildfire. Killing of trees by wildfire.

This item aids users of data to track the history of stand development. It is used in timber supply projections, and it provides information for harvest studies.

Item 17--Kind of disturbance before OCC 2. 1-digit code, printed by the computer. It indicates the type of most recent disturbance recorded by the field crew in the previous inventory. Codes are defined in Item 16. Update the printed code if it can be determined that the previous crew miscoded the item. For reconstructed subplots record for each condition class if cut before 1981.

Item 18--Date of disturbance since OCC 2. If a disturbance was coded in Item 16, record a 2-digit code stating the year of the disturbance that occurred since OCC 2. A disturbance in 1984 is coded 84. If a zero was recorded in Item 16, enter nothing for this item. For reconstructed subplots estimate age of cutting, or fire, and record here if disturbance occurred since 1981. On subplots with harvest since OCC 2, rely on the best available information in determining the date of disturbance. When visiting a subplot on which disturbance has occurred, the freshness of stumps, slash and degree of revegetation are indicators of date of disturbance. In clearcuts, the age of the regeneration stand may provide a "yardstick" to date the harvest, but remember to account for the time elapsed between harvest and planting. In partial cuts, one can estimate date of disturbance by boring residual trees in order to count the number of rings since release; this technique may also be applied to clearcuts by boring trees located in adjacent stands that are on the clearcut boundary. When dating by boring, consider whether to add an extra year (or years) as release often is not evident in the first year following harvest.

When feasible, confirm the date of harvest or fire. This may be done in a variety of ways. Prior to visiting a plot, the field coordinator or crew can "prescreen" the photos for disturbance and, if signs of harvest or fire are present, inquire of the owner during a contact to gain access; or check with the owner or a near-by neighbor after leaving the plot. A general rule of thumb: apply your ingenuity in confirming the date of disturbance, but do so in a manner that incurs little or no cost. If confirmation requires more than 15 minutes for a plot, the cost is likely excessive; however, as a minimum, make an estimate for date of disturbance based on field observations made on the plot.

Record "YES" or "NO" in "IS DATE OF DISTURBANCE SINCE OC2 CONFIRMED?" on the Plot Record.

Item 19--Date of disturbance before OCC 2. 2-digit code, printed by the computer. It indicates the year of most recent disturbance, as determined by the field crew in the OCC 2 inventory. Update the printed code if it can be determined that the previous crew miscoded the item or "??" is printed on the Subplot Attribute Record. Some areas in California may have been harvested as late as 1982 and still have been cut before the plot was established. On reconstructed subplots, estimate age of cutting and record here if before 1981.

Item 20--Silvicultural treatment since OCC 2. Record a 2-digit code that describes silvicultural treatments since the OCC 2 inventory for the condition class. Code only for activities that have occurred within 17 meters of the subplot centers of the condition class. Use combinations of codes to record multiple treatments. For example: 41 would be site preparation and planting.

CODE	KIND OF CULTURAL ACTIVITY
00	No treatment
01	Planting
02	Plant holes
03	Precommercial thin
04	Site preparation
05	Clean and release
06	Underplant
07	Improvement cut
08	Stand conversion

Definitions of silvicultural treatments:

Planting. Planting the plot with desirable growing stock.

Plant holes. Spot planting of nonstocked holes.

Precommercial thin. An intermediate harvest in which excess growing stock are removed and are not sold.

Site preparation. Removal of young hardwoods, brush, ferns slash, and other inhibiting materials. Soil may be furrowed.

Clean and release. Removal or killing of undesirable species of vegetation (usually brush or hardwoods).

Underplant. Planting under a sawtimber overstory.

Improvement cut. The removal of unsalable material in order to free crop trees from competition. Improvement cutting differs from a commercial thinning in that the material removed is not marketable.

Stand conversion. Removal of unmarketable trees (primarily hardwoods) in order to plant the area with desirable growing stock.

Item 21--Mixed conifer site. Record a 1-digit code (Y or N) indicating if the condition class is a mixed conifer site. To classify as a mixed-conifer site the condition class must be capable of being stocked with greater than 70% conifers and one of the following must be true:

1. Douglas-fir predominates and the county is NOT Del Norte (015), Humboldt (023), Marin (041), Mendocino (045), Napa (055), San Mateo (081), Santa Clara (085), Santa Cruz (087) or Sonoma (097).
2. Sugar pine (117) or incense cedar (081) predominate .
3. Ponderosa pine (122) and/or Jeffrey pine (116) either singly or in combination predominate but make up less than 80% of the conifer stocking.
4. White fir (015), and/or red fir (020) and/or Shasta red fir (021) either singly or in combination predominate but make up less than 80% of the conifer stocking.

On a mixed conifer site a complex association of ponderosa pine, sugar pine, Douglas-fir, white fir and red fir may exist. Incense-cedar may also be a component. Generally, these five or six conifer species are intermixed either as single trees or in small groups. Vertical mixing is also common with one to three species in the overstory and one or two species in the understory. Mixed conifer sites are often on east facing slopes of the Coast Range, and on the west facing and higher elevation east facing slopes of the Cascades and Sierra Nevadas.

Item 22--Stand Age (for slivers only). Record a 2-digit code to represent the average age of the main stand of the sliver condition class. The codes are in 10-year age categories and split between even-aged and uneven-aged. To be even-aged, the ages of 70% of the trees must be within 30 years. If it is uneven-aged, then pick the age class that predominates. If there is less that 10% stocking, then code the sliver condition class "99".

Stand age	even-aged code	uneven-aged code
00-09	01	51
10-19	02	52
20-29	03	53
30-39	04	54
40-49	05	55
50-59	06	56
60-69	07	57
70-79	08	58
80-89	09	59
90-99	10	60
100-109	11	61
110-119	12	62
120-129	13	63
130-139	14	64
140-149	15	65
150-159	16	66
160-169	17	67
170-179	18	68
180-189	19	69
190-199	20	70
200-299	21	71
300+	22	72

Item 23--Forest Type (for slivers only). Record the 3-digit code of the predominate tree species of the sliver condition class. Use tree species codes on page 156, or "299" for mixed conifer. If the condition class is mixed conifer record "Y" on Item 21.

Item 24--Stand Size (for slivers only). Record a 1-digit code for the stand-size class of the sliver condition class.

code	stand-size class	description
1	seedlings and saplings	The predominate trees in the sliver condition class are <12.5 cm dbh.
2	poletimber	The predominate trees in the sliver condition class are >12.4 cm dbh and <22.5 cm dbh.
3	small sawtimber	The predominate trees in the sliver condition class are >22.4 cm dbh and <52.5 cm dbh.
4	large sawtimber	The majority of the trees in the sliver condition class are >52.4 cm dbh.
6	nonstocked	The sliver condition class is <10% stocked.

Item 25--Crown Closure OCC 2 (for harvested access-denied plots only). Record the crown closure at OCC 2 of the condition class to the nearest 5%. Use the OCC 2 photos and average the crown closure of the subplots to get a condition class crown closure.

Item 26--% Crown Closure OCC 3 (for harvested access-denied plots only). Record the crown closure at OCC 3 to the nearest 5%. Use the OCC 3 photos or ground observation if harvest has occurred after OCC 3 photography. Average the crown closure of the subplots to get a condition class crown closure.

Item 27--Plant Indicator Set #. Record 1 or 2 for each condition class.
Indicates the set of plant indicators associated with each condition class.

IV. SITE INDEX AND PLANT INDICATORS

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IV. SITE INDEX AND PLANT INDICATORS

A. Introduction

Site index indicates the average height of the dominant--or sometimesdominant and codominant--trees in the stand at a specificed base age. Site index is used as a measure of site productivity under the assumption that dominant tree height is unaffected by competition. Site index is, in fact, closely correlated with site productivity in areas of abundant moisture where tree density (# of trees/hectare) is a function of available light. In such areas, site index alone is an adequate index of the relative timber productivity of different timber stands. However, in the arid West, available moisture, not light, determines the maximum density attainable on a given site. Thus, on drier sites, site index alone is an inadequate measure of site productivity and a measure of the site's stocking capacity is also needed.

The index that we use for stocking capacity is stand density index--the number of 10-inch trees needed to fully occupy the site. (Please excuse the English units.) Stocking capacity is estimated from multiple regression equations based on plant indicators and physiographic variables. The equations appear on pages 62-71 of this manual.

In California, a site index will be recorded for each plot in which any part of any subplot is in timberland (GLC 20) or low productivity forest land (GLC 49). In addition, in all areas except ecological unit 8, (the north and central coast) appropriate plant indicators will be recorded.

B. Plot Site Index - Site Trees

1) Objective. Information on site index is used to evaluate the quality of a site for growing trees. Site index describes the relationship of tree height to tree age.

Each plot which has any part of any subplot in timberland (GLC 20) or low productivity forest land (GLC 49) should have at least three representative site tree measurements. All site tree selections must adequately represent the conditions of the designated plot.

Instructions by the reviewer to the field crew for collecting site data will be noted in "FIELD CHECK ITEM" on the Plot Record. New site tree data will be requested of the field crew when the site index information from OCC 2 is incomplete, absent, or unreliable. Always take new site trees if tree was under 30 years at OCC 2, site varies by more than 30 at OCC 2, or less than three trees were taken at OCC 2. Be sure that these differences are not due to within site differences.

If you cannot obtain the required minimum number of site trees, get as many as possible and make a note to that effect in "PRESENT CONDITION/PAST DISTURBANCE" on the Plot Record. If there is more than 1 condition class on the plot, note from which condition class the site trees come in "PRESENT CONDITION/PAST DISTURBANCE" on the plot record.

Recording Site Index Data. This is a computer printed and field entered item. Site information collected at previous occasions will be printed and reviewed in the office for acceptability. The field crew will write the information on a separate line in the appropriate columns when instructed to collect more site tree data. See below for general rules in collecting site trees, and the site equations used for various species.

2) General rules for selecting site trees.

(l) Select only dominant conifer trees that characterize the plot.

(2) Avoid using trees that have ever been suppressed. Be particularly careful when in residual stands from which the dominant trees have been harvested. When using true fir site trees, be sure that they are not released understory trees, thus one should use only large true firs that have been in the dominant crown class much of their lives. As a rule, never use true fir trees under 50 years.

(3) Whenever possible, use trees greater than 50 years old. For Douglas fir and Ponderosa pine the ideal trees would be between 60 and 120 years.

(4) Site index should not vary by more than 30 between site trees unless the difference can be explained by actual site variation within the plot.

(5) Site trees should be trees which show no signs of top out such as crooks or forks, UNLESS these trees are greater in height than any other trees of comparable age and diameter on the site.

(6) If there are no suitable site trees tallied on the plot, select dominant trees nearby from the same general aspect and elevation, and note that the site trees were obtained off the sample plot.

3) Data recording. For each site tree measured, record the following:

a) Site Tree # (#). Record a 1-digit code indicating the number of the site tree. Numbers will be downloaded for OCC 2 site trees. Field crews will add the condition class as the first digit and new numbers of any new OCC 3 site trees.

b) Subplot # (SUB PLT #). Record a 2-digit code indicating the number of the subplot on which the site tree is found or which the site is near. Numbers will be downloaded for OCC 2 site trees.

c) Azimuth (AZ). Record an azimuth of the site tree from subplot center for all new site trees even if the tree is not within the 17-meter fixed radius. This will help OCC 4 field crews to relocate and remeasure the site tree.

d) Species (SPC). Record a 3-digit code using the same codes as those used in tree tally. Codes will be downloaded for OCC 2 site trees, and must be added for any new OCC 3 site trees.

e) Dbh (DBH). Record a 4-digit code. Record to the nearest millimeter. DBH may be estimated. DBH need not be updated.

f) Height-OCC 1,2,3 (HT). Record a 3-digit code; record to the nearest decimeter. Do not change downloaded OCC 1 or OCC 2 heights.

g) Remeasured height OCC 3 (RHT). Record a 3-digit code; record to the nearest decimeter. Record an OCC 3 height for all trees <= 50 years of age at OCC 2. This will be used to check regression equations for young trees.

h) Breast-high age-OCC 1,2,3 (BH AGE). Record a 3-digit code indicating the tree's age at breast height. Age need not be udpated.

i) Occasion Recorded (OCC REC). Record a 1-digit code indicating the occasion number of the first measurement of the site tree.

j) Site Index (SI). Site index is calculated by the data recorder. The computer program will prompt the field crew as to whether a mixed conifer site table should be used. Site index should not vary by more than 30 between site trees unless the difference can be explained by actual site variation within the plot.If it has to be done by hand, use height and age and record a 3-digit code for site index from the appropriate site index tables. Upper limits will be used, meaning that heights falling between two site indices will select for the higher index.

Example: Coastal Doug-fir, 75 years at breast-height age, height 350 decimeters. Using King's Doug-fir site table, a height of 350 at age 75 falls between site index 80 and 90, the site index would be 90.

4) Site Table Selection. When choosing site tree species and site index tables for looking up site index use the following guide:

a) Coastal Douglas-fir Type-- Found only in coastal counties in northwestern California on the west slopes of the Coast Range. It is often found in combination with redwood, forming more pure stands on the higher, drier slopes. Grand fir is another component of Douglas-fir-redwood and Douglas-fir stands, or this type is occasionally found in pure stands. Sitka spruce, red alder, western hemlock, and western red-cedar may also be found in the coastal plot.

When in the coastal Douglas-fir type use Kings Douglas-fir site table for Douglas-fir and grand fir; use the redwood site table for redwood; use the Wiley western hemlock site table for western hemlock and sitka spruce. When in the coastal Douglas-fir type use the red alder site table for red alder which is on sites only capable of growing hardwoods.

b) Ponderosa Pine Type-- Found in pure stands (80 percent or more of stand before cutting) with Jeffrey pine as an important associate. On the west slopes of the Cascades and Sierras and east slopes of the Coast Range this type is found above the Digger pine and oaks and below the mixed conifer. It is found with minor stand components of oaks, and on better sites, sugar pine, Douglas-fir, white fir, and incense-cedar. However, these species combined never total more than 20 percent on the stand.

When in the ponderosa pine type use the ponderosa pine site table. Use Douglas-fir or white fir only if pine is not available and if you have selected Douglas-fir or white fir within the Ponderosa pine type use the mixed conifer site table. If Ponderosa pine is a plurality but white-fir or Douglas-fir either singly or together comprise more than 20% of the stand then you are in a mixed conifer type and use the mixed conifer site table (see below).

c) Red Fir Type-- Found above the mixed conifer type at elevations of approximately 2000 meters. Red fir is the dominant species with white fir present at the lower elevation range. At the upper elevation it borders a thin band of mountain hemlock found just below timberline.

When in the red fir type use the red fir site table for red and white fir in this type. Beware of white fir which is often subject to suppression.

d) Mixed Conifer Type-- If the stand contains Douglas-fir, ponderosa pine, and white or red fir, and does not fit in one of the above three types, use the mixed conifer site table. A complex association of ponderosa pine, sugar pine, Douglas-fir, and white and red fir may predominate. Incense-cedar is also a component. Generally, these five or six conifer species are intermixed either as single trees or in small groups. Vertical mixing also is common with one to three species in the overstory and one or two species in the understory. Mixed conifer types grow on the east facing slopes of the Coast Range, and on the west facing and higher elevation east facing slopes of the Cascades and Sierra Nevadas. This type also extends south into southern California. (See above under Item 21 for rules about mixed conifer type.)

When in the mixed conifer type use the mixed conifer site index table for

ponderosa pine, Douglas-fir, white and red fir. These four species are the only acceptable site trees for this type. They may be used as single species or in combination.

e) Lodgepole Pine Type-- Found generally at higher elevations in the Sierra Nevadas. Use the lodgepole pine site table for this type.

f) Mountain Hemlock Type-- Found at high elevations above the red fir type. Use other site trees if possible. When mountain hemlock is the only available site tree, use the noble fir site table.

g) Western White Pine-- Not a type, only found at higher elevations. Use other site trees if possible. When western white pine is the only available site tree, use the lodgepole pine site table.

h) Coulter Pine Type-- Found in the Central Coast plot. May be used as a site tree with either the ponderosa pine or the mixed conifer site tables.

Site tables were not used in the field to determine site index.

Site Equations were used in data recorders for site calculations. These equations are found in the Techniques manual included on this CD.

B. Plant Indicators.

The state of California is divided into eight ecological units. In order to estimate the stocking capacity of each plot area, separate stockablility equations have been developed for each unit except unit 8 which lacks an equation. The equations are based, in part, on the presence or absence of certain plants. The plant indicators required for each ecological unit are listed below and the actual equations follow the tables. You will note that the presence of some plants indicates a dry site that limits stand density (-) while the presence of others indicates a moist site that enhances stand density (+), and that the degree of stocking limitation or enhancement varies from indicator to indicator. In addition, some plant indicators can stand for each other in the equation; thus in Ecological Unit 2 if Mountain whitethorn (CECO-2) is collected, it is not necessary to hunt for Deer-brush (CEIN-3) or vice versa.

Usually, a single list of plant indicators will be sufficient for each plot. Sometimes, however, plots with two or more timberland condition classes may include two or more sites with different stocking limitations (note: different condition classes do not automatically make for different stocking limitations). In this case, an additional set of indicators will be collected. The plot reviewer will record a note in "FIELD CHECK ITEM" on the Plot Record if he/she thinks that more than one set of indicators may be required.

For each plot, two sets of plant indicators are possible.

Remeasured plots. For remeasured plots, an asterisk will mark the plant indicators under Set 1 which were found at OCC 2. Mark with an asterisk any additional indicators under Set 1 which are found on the plot. (If there are newly established subplots on the plot, more indicators may well be found). On remeasured plots, specifically look for those species which were left off the indicator list at Occasion 2. These species are: Red fir (ABMA-2) in Ecological Unit 1; Deer-brush (CEIN-3) in Ecological Unit 2; Erysimum captiulatum (ERCA-3) and Erysimum perenne (ERCA-3) in Ecological Unit 3; and big sage (ARTR) in Ecological Unit 7.

Usually, Set 1 will be sufficient for a plot. Occasionally, however a condition class change is also a change in stocking limitation. In this case, create two plant indicator lists by marking with an asterisk the plant indicators associated with that condition class under Set 2. Record on the Plot Attribute Record (Item 27) the Plant Indicator Set # for each condition class on the plot.

Newly established plots. For newly established plots, the plot reviewer will record the plot's ecological unit on the Plot Record under "FIELD CHECK ITEM". Mark with an asterisk any of the plant indicators found on the plot under Set 1. As above, if a condition class change is also a change in stocking limitation, create two plant indicator lists by marking the plant indicators associated with that condition class under Set 2. Record on the Plot Attribute Record (Item 27) the Plant Indicator Set # for each condition class on the plot.

Ecological Unit 1 - Shasta and Trinity

Trees		
ABMA-2 *	Abies magnifica	Red fir
PILA	Pinus lambertiana	Sugar pine
PIPO	Pinus ponderosa	Ponderosa pine
PSME	Pseudotsuga menziesii	Douglas-fir
QUGA-2	Quercus garryana	Oregon white oak
QUKE	Quercus kelloggii	California black oak
QUWI	Quercus wislizenii	Interior live oak
Shrubs		
CASE-3	Castanopsis sempervirens	Bush chinquapin
CEBE-2	Cercocarpus betuloides	Birchleaf mountain-mahogany
CECU-2	Ceanothus cuneatus	Wedgeleaf ceanothus
CELE-1	Ceanothus lemmonii	Lemmon ceanothus
CELE-3	Cercocarpus ledifolius	Curlleaf mountain-mahogany
CEOC	Cercis occidentalis	California redbud
CEPR	Ceanothus prostratus	Mahala mat
PREM	Prunus emarginata	Bitter cherry
QUGAB	Quercus garryana v brewerii	Brewer oak
Herbs		
ASA	Asarum sp. herbaceous	Wild ginger
CHUMO	Chimaphila umbellata (recorded as CHUM at OCC2)	Prince's pine
PTAN	Pterospora andromedea	Pinedrops
PYPI	Pyrola picta	White-veined pyrola
SMI-1	Smilacina spp	False Solomon-seal
TRLA-3	Trientalis latifolia	Star-flower

* Not reported as an indicator at OCC2.

Equation for Ecological unit 1--Shasta and Trinity Counties

Weighted plant discount factor (WDF)=[-2 - 47(X1) - 84(X2) +62(X3) + 99(X4) + 39(X5) + 92(X6) + 64(X7) + 33(X8) + 61(X9) + 32(X10) - 44(X11) + 0.00007739(X12) + 0.00001476(X13) - 0.000000009(X14)]/NSDI

OR if WDF is >0.8, set WDF = 1.0

Where: X1=CECU-2,CEBE-2,OR CELE-3.

X2=CEOC OR CELE-1

X3=QUGA-2,QUGAB, OR QUWI

X4=ABMA-2

X5=PILA OR PSME

X6=CASE-3 OR PREM

X7=QUKE

X8=PYPI, TRLA-3, OR ASA

X9=CHUMO, CHUM, PTAN,OR SMI-1

X10=PIPO

X11=CEPR

X12=ELEVATION (IN METERS) SQUARED

X13=DUNNINGS SITE (IN FEET) SQUARED * ELEVATION

X14=DUNNINGS SITE SQUARED * ELEVATION SQUARED

Ecological Unit 2 - Western Tehama, Glenn, Colusa, Sutter, Lake, Napa, and Yolo

Trees		
PISA-2	Pinus sabiniana	Digger pine
QUGA-2	Quercus garryana	Oregon white oak
Shrubs		
ARCA-5	Arctostaphylos canescens	Hoary manzanita
ARMA-3	Arctostaphylos manzanita	Big manzanita
ARVI-3	Arctostaphylos viscida	Whiteleaf manzanita
CECO-2	Ceanothus cordulatus	Mtn. whitethorn
CEIN-3 *	Ceanothus integerrimus	Deer-brush
QUDU-2	Quercus dumosa - (recorded as QUDU-1 at OCC2)	Scrub oak
QUGAB	Quercus garryana v brewerii	Brewer oak
ROGY	Rosa gymnocarpa	Wild rose
Herbs		
PHSPO	Phlox speciosa ssp occidentalis	Phlox

* Not recorded as an indicator at OCC2. If CECO-2 was recorded, it is not necessary to hunt for CEIN-3.

Equation for Ecological unit 2

WDF= [358 + 209(X1) - 44(X2) - 37(X3) + 49(X4) - 98(X5) - 114(X6) - 82(X7) - 55(X8)]/NSDI.

OR if WDF is >0.8, set WDF = 1.0

WHERE: X1 = STAND BASAL AREA >50 PERCENT TRUE FIR
X2 = SOIL DEPTH > 45.7 CM
X3 = ARCA-5
X4 = ROGY
X5 = PHSPO
X6 = ARMA-3 OR ARVI-3
X7 = CECO-2 OR CEIN-3
X8 = PISA-2, QUGA-2,QUGAB OR QUDU-2

Ecological Unit 3 - Modoc, Lassen, eastern Plumas, Eastern Sierra, eastern Nevada, eastern Placer and eastern Eldorado

Trees		
ABMA-2	Abies magnifica	Red fir
Shrubs		
CEBE-2	Cercocarpus betuloides	Birchleaf mt. mahogany
CELE-3	Cercocarpus ledifolius	Curlleaf mt. mahogany
RICE	Ribes cereum-inebrians	Squaw currant
RIRO	Ribes roezlii	Sierra gooseberry
SYM-3	Symphoricarpos spp.	Snowberry
Herbs		
ACLA-2	Achillea lanulosa	Western yarrow
AGHE	Agoseris heterophylla	Mountain dandelion
AGRE-2	Agoseris retrosa	Mountain dandelion
BAL	Balsamorhiza spp.	Balsam root
BRTE	Bromus tectorum	Cheatgrass
CAUM-2	Calyptridium umbellatum	Pussypaws
CHUMO	Chimaphila umbellata (recorded as CHUM at OCC2)	Prince's pine
ERCA-3 *	Erysimum capitatum	
ERPE-3 *	Erysimum perenne	
LICI	Linanthus ciliatus	Bristly-leaved linanthus
LINU-2	Linanthus nuttalli	Nutall's linanthus
LONU-1	Lomatium nudicaule	Hog-fennel
LOPL	Lomatium plummerae	Hog-fennel
OSCH	Osmorhiza chilensis	Sweet-cicely
POT-2	Potentilla spp.	Cinquefoil
PTAN	Pterospora andromedea	Pinedrops
PYPI	Pyrola picta	White-veined pyrola
PYPA	Pyrola picta v aphylla	Leafless pyrola
SMI-1	Smilacina spp.	False Solomon-seal
STI-1	Stipa spp.	Needlegrass

* Not recorded as a plant indicator at OCC2.

Equation for Ecological Unit 3- Modoc, Lassen, eastern Plumas, Eastern Sierra, eastern Nevada, eastern Placer and eastern Eldorado

WDF = [318 - 55(X1) + 74(X2 - 47(X3) + 86(X4) - 44(X5) - 61(X6) + 42(X7) + 63(X8) - 59(X9) - 99(X10) - 44(X11) - 77(X12) - 115(X13) - 35(X14)]/NSDI

OR if WDF is >0.8, set WDF = 1.0

WHERE:X1 = SOIL DEPTH > 45.7 CM
X2 = ABMA-2
X3 = CELE-3 OR CEBE-2
X4 = SYM-3
X5 = RICE, OR RIRO
X6 = BRTE OR STI-1
X7 = ACLA-2
X8 = OSCH, SMI-1, CHUMO, CHUM, PTAN, PYPI OR PYPIA
X9 = ERPE-3 OR ERCA-3 (SHOULD BE ADDED TO 91 PLANT GUIDE)
X10 = LONU-1 OR LOPL
X11 = BAL
X12 = POT-2
X13 = CAUM-2, LICI, OR LINU-2
X14 = AGHE, OR AGRE-2

****ERYSIMUM PERENNE AND E. CAPITATUM NOT COLLECTED AT OCC2(ERPE-3,ERCA-3)****

Ecological Unit 4 - Western Sierra, western Nevada, Yuba, western Placer, and western El Dorado.

Trees
(none)

Shrubs

ARVI-3	Arctostaphylos viscida	Whiteleaf manzanita
CECU-2	Ceanothus cuneatus	Wedgeleaf ceanothus
RULE	Rubus leucodermis	Western raspberry

Forbs

GOOB	Goodyera oblongifolia	Rattlesnake plaintain
POCO-6	Polygala cornuta	Milkwort
SIHY	Sitanion hystrix	Bottlebrush squirreltail
VILO	Viola lobata	Violet

Equation for Ecological unit 4 -

$$WDF = [171 + (X1) - 142(X2) - 54(X3) - 105(X4) - 109(X5) + 127(X6) - 153(X7) + 99(X8) - 109(X9) + 0.O005118(X10)]/NSDI$$

OR if WDF is >0.8, set WDF = 1.0

WHERE: X1 = UTM NORTH IN 1000 M MINUS 4200
X2 = SOIL DEPTH < 45.7 CM
X3 = ARVI-3
X4 = CECU-2
X5 = RULE
X6 = GOOB
X7 = POCO-6
X8 = VILO
X9 = SIHY
X10 = (DUNNINGS SITE INDEX--IN FEET)(ELEVATION--IN METERS)

Ecological Unit 5 - Amador, Calaveras, Tuolumne, Mariposa, Madera, Fresno, Tulare, Kern

Trees		
PIMO-3	Pinus monticola	Western white pine
PISA-2	Pinus sabiniana	Digger pine
QUDO	Quercus douglasii	Blue oak
UMCA	Umbellularia californica	California laurel-myrtle
Shrubs		
CEBE-2	Cercocarpus betuloides	Birchleaf mt. mahogany
CELE-3	Cercocarpus ledifolius	Curlleaf mt. mahogany
CECU-2	Ceanothus cuneathus	Wedgeleaf ceanothus
GAFR	Garrya fremontii	Garrya silktassel
QUGAS	Quercus garryana v semota	Keweah oak
RHCRI	Rhamnus crocea v ilicifolia	Redberry
Herbs		
ADBI	Adenocaulon bicolor	Trail plant
CHME-2	Chimaphila menziesii	Pipsissewa
CHR-8	Chrysothamnus spp.	Rabbit-brush
CHUMO	Chimaphila umbellata (recorded as CHUM at OCC2)	Prince's pine
DIS-3	Disporum spp.	Fairy bells
GOOB	Goodyera oblongifolia	Rattlesnake plantain
PESE-3	Pedicularis semibarbata	Indian warrior
PTAN	Pterospora andromedea	Pinedrops
PYPI	Pyrola picta	White-veined pyrola
PYPIA	Pyrola picta v aphylla	Leafless pyrola
SIHY	Sitanion hystrix	Bottlebrush squirrel tail
SMI-1	Smilacina spp.	False Solomon-seal
VILO	Viola lobata	Violet

Equation for Ecological unit 5 -

$$WDF = [328 + 267(X1) - 112(X2) + 92(X3) + 161(X4) + 194(X5) - 91(X6)]/NSDI$$

OR if WDF is >0.8, set WDF = 1.0

WHERE: X1 = PIMO-3
X2 = UMCA, QUDO, QUGAS, CECU-2, CEBE-2, CELE-3, RHCRI, CHR-8, GAFR, OR PISA-2
X3 = PTAN
X4 = CHME-2,CHUMO, CHUM, PYPI, PYPIA, ADBI, GOOB, VILO, DIS-3, OR SMI-1
X5 = PESE-3
X6 = SIHY

Ecological Unit 6 - Eastern Tehama, Butte, western Plumas

Trees		
ABCO	Abies concolor	White fir
ABGR	Abies grandis	Grand fir
ABMA-2	Abies magnifica	Red fir
QUGA-2	Quercus garryana	Oregon white oak
Shrubs		
CEBE-2	Cercocarpus betuloides	Birchleaf mt. mahogany
CECU-2	Ceanothus cuneatus	Wedgeleaf ceanothus
CELE-1	Ceanothus lemmonii	Lemmon ceanothus
CELE-3	Cercocarpus ledifolius	Curlleaf mt. mahogany
CEOC	Cercis occidentalis	California redbud
CEPR	Ceanothus prostratus	Squaw carpet
PRSU-2	Prunus subcordata	Klamath plum
Herbs		
BRTE	Bromus tectorum	Cheatgrass
CHUMO	Chimaphila umbellata (recorded as CHUM at OCC2)	Prince's pine
PYPI	Pyrola picta	White-veined pyrola
PYPIA	Pyrola picta v aphylla	Leafless pyrola

Equation for Ecological unit 6.

WDF = [-223.814 + 67.8407(X1) + 145.5649(X2)`+ 34.9109(X3` + 39.205(X4) + 37.4798(X5) - 47.9219(X6) + 50.712(X7) - 51.67(X8) - 84.0552(X9) - 3.9563(X10) + 0.75176(X11) + 0.0116262(X12) - 0.000007242(X13) - 0.0002654(X14)]/NSDI

OR if WDF is >0.8, set WDF = 1.0

WHERE X1 = ABGR, ABMA-2, ABGR, ABCO
X2 = ABMA-2
X3 = ABCO PRESENT, ABMA-2 ABSENT
X4 = PYPI
X5 = PYPIA OR CHUMO
X6 = CEPR
X7 = QUGA-2
X8 = PRSU-2
X9 = CECU-2, CELE-1, CEBE-2 CELE-3 OR CEOC
X10 = BRTE
X11 = ELEVATION IN METERS
X12 = (DUNNING SITE IN FEET**2)
X13 = (DUNNINGS SITE**2)(ELEVATION)
X14 = (ELEVATION**2)

Ecological Unit 7 - Siskiyou

Trees		
ABMA-2	Abies magnifica	Red fir
ABMAS	Abies magnifica v shastensis	Shasta red fir
JUOC	Juniperus occidentalis	Western juniper
PICO-1	Pinus contorta	Lodgepole pine
QUGA-2	Quercus garryana	Oregon white oak
SAL13	Salix spp.	Willow
Shrubs		
ARVI-3	Arctostaphylos viscida	Whiteleaf manzanita
RHTR	Rhus trilobata	Skunk bush
ARTR*	Artemisia tridentata	Big sage brush
Herbs		
AGR-1	Agropyron spp.	Wheatgrass
AGSP	Agropyron spicatum	Wheatgrass
ADBI	Adenocaulon bicolor	Trail plant
CAAP	Castilleja applegatei	Indian paintbrush
CHR-8	Chrysothamnus spp.	Rabbit-brush
FES-1	Festuca spp.	Fescue
LONU-1	Lomatium nudicaule	Hog-fennel
SMI-1	Smilacina spp.	False Solomon-seal

* Not recorded as an indicator at OCC 2

Equation for Ecological Unit 7.

WDF = [356 + 81(X1) + 0.01114(X2) - 80(X3) - 71(X4) - 53(X5) - 246(X6) - 80(X7) - 131(X8) - 76(X9) + 84(X10) - 98(X11) - 64(X12) - 118(X13) - 54(X14) /NSDI

OR if WDF is >0.8, set WDF = 1.0

WHERE;X1 = ABMA-2, ABMAS, ADBI, OR SMI-1
X2 = ANNUAL PRECIPITATION IN CENTIMETERS
X3 = CHR-8
X4 = FES-1
X5 = QUGA-2
X6 = PICO-1 WHEN TOPO POSITION = 7
X7 = AGR-1 OR AGSP
X8 = LONU-1
X9 = ARVI-3
X10 = SAL13 WHEN TOPO POSITION NE 9
X11 = CAAP
X12 = JUOC
X13 = RHTR
X14 = ARTR

Ecological Unit 8 -- (There are no stockability equations with plant indicators for Ecological Unit 8)

III. PLOT LAYOUT AND REFERENCING

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III. PLOT LAYOUT AND REFERENCING

A. Plot layout.

1) Objectives. The plot layout is designed to meet several objectives:

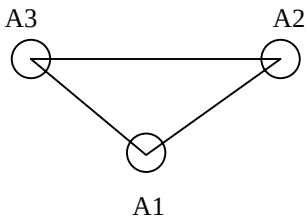
a) Sample the mix of ground land class and forest condition classes that may occur in a 2.5 ha plot.
b) Monitor changes in ground land class and forest condition that may occur on that 2.5 ha plot.
c) Remeasure trees to provide information on change (growth, mortality, and cut).
d) Assess (by means of a cluster design) the variability of stocking within the cluster plot area.
e) Maintain inventory efficiency by minimizing the total number of sample subplots in this cluster.
f) Systematically sample the plot.

2) OCC 3 plot layout (see following page for diagram). The subplot 1 center location is the permanent photo and map identification point used to determine the plot's location. All plots are laid out to the north with the standard 5-subplot cluster design. (See following page)

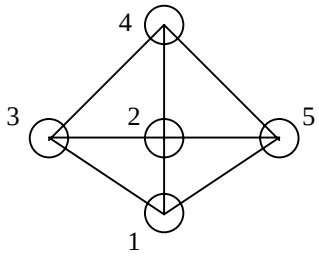
3) Comparison with OCC 2 layout. Where OCC 2 points were laid out on this standard pattern, OCC 3 subplots will coincide with OCC 2 points. Where OCC 2 points were substituted, the substituted points will be abandoned and new subplots established on the regular pattern north. If OCC 2 points were moved, remeasure the moved subplot if it is in condition class 1 and establish a new subplot at the standard location.

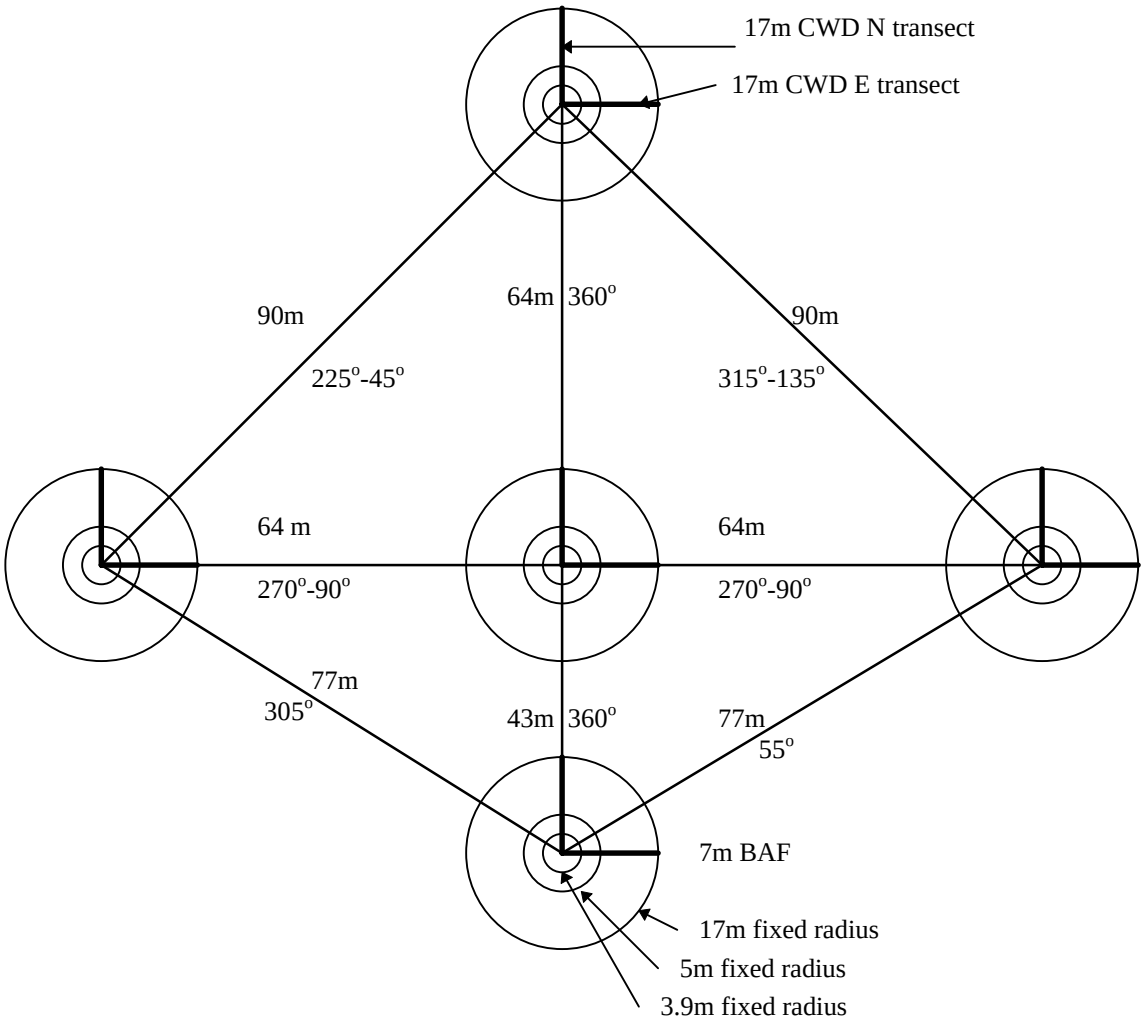
4) OCC 2 Oak-Woodland 3-point plots. At OCC 2 some oak woodland plots were established as 3-point plots in the layout below-left. These plots will now be established in the 5 subplot layout below-right. Note that OCC 2 A1 and A3 correspond to the OCC 3 subplot 1 and subplot 3 locations and that A2 corresponds to the OCC 3 subplot 5 location. Point A1 will be called subplot 1, point A3 will be called subplot 3 and point A2 will be called subplot 5. Subplots 2 and 4 will be new subplots.

OCC 2 Oak-Woodland 3-point plot



OCC 3 standard layout





CALIFORNIA STANDARD FIVE-POINT PLOT LAYOUT

B. Classifying/Establishing Subplots

A plot is comprised of five 17 meter subplots. However, a subplot will not be classified or established if it meets any one of the following conditions:

1. The entire 17 meter subplot is on National Forest Land.
2. The entire 17 meter subplot falls in an area that is reserved from timber harvest by law or official policy.
3. The entire 17 meter subplot falls in a body of water over 16 ha (40 acres) in size, or a river over 200 meters wide.

In addition, while all subplots in the inventory will be visited for confirmation of classification, a subplot will be established only if:

a part of the 17 meter subplot includes timberland, or low productivity forest land, or oak woodland on the 11K grid.

If fewer than five subplots are established, write the reason in "Contact Office About" on the Plot Record.

1) Measured Forest Land Subplots. Any subplot will be classified and established when at least some part of the subplot includes timberland (GLC 20), or low productivity forest land (GLC 49), or oak woodland (GLC 44) on the 11K grid.

2) Other Forest Subplots. Any subplot falling entirely in ground land classes 41-43, 44 (not on the 11 K grid), 45, 47-48 will be classified but will not be established on the ground.

3) Nonforest Subplots. Any subplot which is entirely nonforest (GLC 63-92) will be classified but will not be established on the ground.

Note: Classification means identifying the ground land class. Establishing means classifying and measuring the area. When a subplot is classified the field crew will fill out the plot record, record the area identification variables for each condition class, number the subplots, and record the percent of each subplot in each condition class. When a subplot is established it will be fully measured.

C. Access-Denied Plots.

When a crew is denied access or encounters a situation that the crew considers too dangerous to do the plot, they will document on a full-sized sheet of paper all of their contacts with phone numbers and describe the dangerous situations and their reasons for not gaining access or doing the plot. They will record the date and their own names. The crew supervisor will then either make further efforts to gain access or will declare the plot not doable. The crew supervisor will also document his/her efforts, recording his/her name and date on the sheet. If the crew supervisor needs help with gaining access or in determining if the plot is not doable, they can refer the plot to the field coordinator and then to the data collection supervisor documenting all contacts on the sheet with dates and names. The sheet will stay with the plot jacket.

There are two categories of access-denied plots:

1) Projected Plots. Plots that were forested and measured at OCC 2 will be projected. This means that past growth data will be used to mathematically grow these plots from OCC 2 and OCC 3. Though we will not be visiting and measuring the plots, the field crew will complete items 1-21 on the Plot Attribute Record for all condition classes on the plot. The field crew will complete certain items for the subplots on the Subplot Attribute Record depending on the subplot number (see page 83) and sample kind of condition class 1. Where stream proximity is required it will be completed by referring to the OCC 2 plot diagram or photos.

Refer to subplot numbering for numbering projected plots (below) and sample kind for access-denied plots. Harvested access-denied subplots will be given a sample kind of 6 and non-harvested access-denied subplots will be given a sample kind of 5. (See sample kind, page 77). In addition, for harvested subplots the field crew will record the OCC 2 % crown closure (from OCC 2 photos) and the OCC 3 % crown closure after harvest (either from OCC 3 photo or from ground observation if harvest occurred after OCC 3 photography and the plot can be seen). Crown closure for access-denied plots is recorded on the Plot Attribute Record. (See crown closure, pages 106-107.)

2) Reselected Plots. Plots that were not measured at OCC 2, but which at OCC 3 have any part of a subplot in timberland, low productivity forest land, or oak woodland on the 11k grid will be reselected with another grid point. Below are the rules for reselection.

a) The photo point selected must be in the same PI forest land stratum as the photo point for which it substituted. (See below).

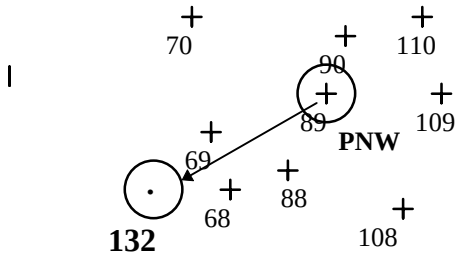
OCC 2 Forest Land Stratum

Timberland (all the FLS 20s)
Other Forest (all the FLS 40s)
Nonforest (all the FLS 60s,92)

Note: All the points were photo interpreted at Occasion 2. The crew

supervisor will have a print out of the PI information on the original grid selection point and the 8 new points (in the order of selection). This printout contains all the information needed for selection. (The columns on the printout: CTY=County; MAP=Quad Map; PLOT=Field plot number; POINT=Photo point; FLS=PI Forest Land Stratum; PHOTO2=Occasion 2 photo number).

b) The photo point selected will be from the grid of 8 points that surround the original grid selection point.



Begin with the photo point to the right of the grid selection point (around + 20). That would be 109 if we started at 89. Continue clockwise (108,88,68,69,70,90,110) until you select one in the same PI forest land stratum AND gain access to the plot. (Someone will have to go to the county courthouse to find the owner's name and address).

c) If no photo point qualifies as a plot, condition class 1 of the plot will be given a sample kind of 0.

d) If a photo point is selected and taken as a plot, this location will become the new plot location. Plot list, PI file and Quad map must all be updated to indicate the change.

e) Write up all the above on the Plot Record, noting reselection in "Contact Office About".

D. Identifying Condition Class

Condition class 1 is defined by the center of subplot 1. While most subplots fall in a single condition, some may straddle condition class boundaries. Since trees on a subplot can be tallied in more than one condition class the first digit of tree history will be used to indicate the condition class that the tree falls in.

There are cases where a condition class will not be associated with any subplot center. These condition classes will be called "slivers". See Chapter IV for the additional information that the field crew will collect on slivers.

A separate condition can be identified in one of three ways:

1) Sampled Area
If a subplot straddles an area which is outside the inventory (National Forest, Reserve, or Census Water), two conditions will be identified.

2) Forest Stand Condition

A separate condition class is identified when a subplot samples a forest stand condition that is different from the stand condition at the center of subplot 1. To classify as a different condition based on forest stand condition, the area must be at least 2.5 ha in area and at least 35 m wide.

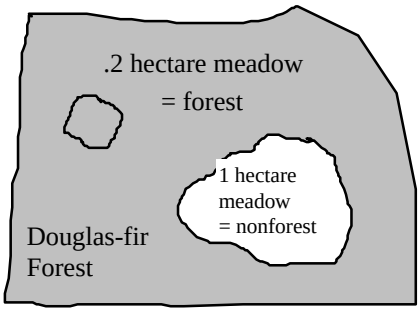
A stand condition is recognized by its broad forest type, its stand size, its stocking density, and its cutting history. A different forest stand condition must be separated from another forest stand condition by a well-defined boundary and each stand condition must occupy at least 2.5 ha. Stand condition boundaries are often associated with changes in physioclass such as: (a) steep north slope vs. steep; south slope. (b) swampy flat vs. well-drained upland. (c) deep-soiled flat vs. thin-soiled upland.

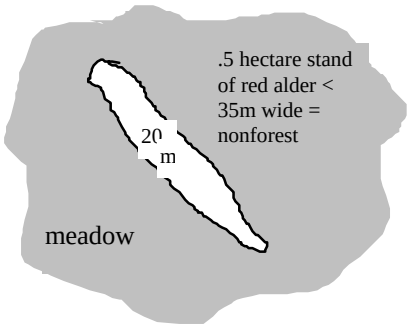
Recognize a new stand condition when crossing a boundary between:

a) Hardwood/conifer or hardwood/mixed conifer-hardwood or conifer/mixed conifer-hardwood
b) Sawtimber/regeneration, old growth/small sawtimber.
c) Well-stocked/poorly stocked or nonstocked.
d) Partially harvested/uncut.

3) Ground Land Class

A separate condition is identified when a subplot samples a ground land class different from the ground land class at the center of subplot 1. The three major categories of ground land class are Forest Land, Other Forest Land, and Nonforest. (See pages 83-86 for ground land class codes and descriptions). To be identified as a different condition class based on ground land class, the area must be at least .4 hectares in area and 35 meters wide. Whenever the subplot falls in an area less than the minimum required, the ground land class (GLC) will be the surrounding ground land class. See examples below.





Following are the exceptions to the above minimum rule for recognizing a land class.

a) Cultural nonforest stringers (constructed roads, railroads, powerlines, pipelines, and canals) 0.4 hectares or larger are called nonforest however there is no minimum width required. (Note: At OCC2 there was a minimum width of 5 meters for cultural nonforest stringers.) Constructed roads are made for car or truck travel. They are used "to get somewhere" and not to skid logs. They are made using machines other than cars or trucks. A fork of a constructed road is nonforest if the constructed road meets the minimum area of .4 hectares to be recognized. Cutbanks along constructed roads are classified as nonforest regardless of the vegetation they support. "Cutbanks" include area that is engineered "cut", part of the road design, where the original topography has been disturbed and modified as a result of roadbuilding. Fills along constructed roads that have been created by dumping fill around large timber will be considered forest until the large timber is cut.

When measuring cultural stringers include all areas that are kept free of tree size vegetation. Include brushed out, cut, or sprayed areas along right-of-ways when they appear different from the adjacent forest land. To help with measuring, note that a 5 meter wide road needs to be 800 meters long to be .4 hectares in area and a 10 meter wide road needs to be 400 meters long to be .4 hectares in area.

If the constructed road, railroad, powerline, etc. is blocked by forest vegetation, the area on either side of the vegetation must be .4 hectares or larger to be called nonforest.

b) Streams 10 meters or wider and 0.4 hectares or larger are called nonforest. (10-meter wide streams must be at least 400 meters long to be .4 hectares.) A fork which is 10 meters wide is nonforest if the main stream meets the above minimum area and width to be recognized as nonforest. When measuring stream width, include all area where the action of water prevents growth of trees to merchantable size. Classify stream margins, sand bars, and islands as nonforest if high water prevents trees from growing to a height of 4 meters.

c) Maintained structures. Maintained structures are always nonforest even when the structure and surrounding site is less than 0.4 hectares. Isolated pumphouses, sheds, and other structures in forested areas are not considered "maintained structures" if the primary use of the subplot area is forest.

E. Identifying boundaries between condition classes

a) Indefinite boundary.
In many areas there may be no distinct boundary between forest and nonforest, between timberland and other forestland, or between different forest stand conditions. Remembering the minimum area rules (2.5 ha for forest stand conditions; .4 ha for ground land classes), code the area in the condition class it is most like.

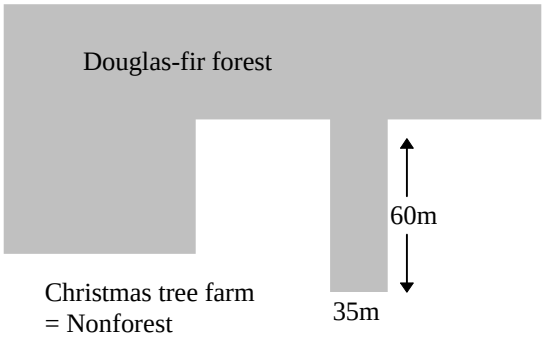
c) Distinct boundary.
A definite forest-nonforest boundary occurs where there is an abrupt change from forest land to land developed for nonforest use. The change is often delineated by a distinct change from forest vegetation to vegetation associated with nonforest use. Definite boundaries are often defined by fences, roads, firelines, yards, hedges or the edges of fields.

Forest vegetation includes trees, shrubs, and forbs of forest ecosystems. Areas with forest vegetation may still be called nonforest if used for nonforest purposes--for example: ferns in pastures or trees in golf courses.

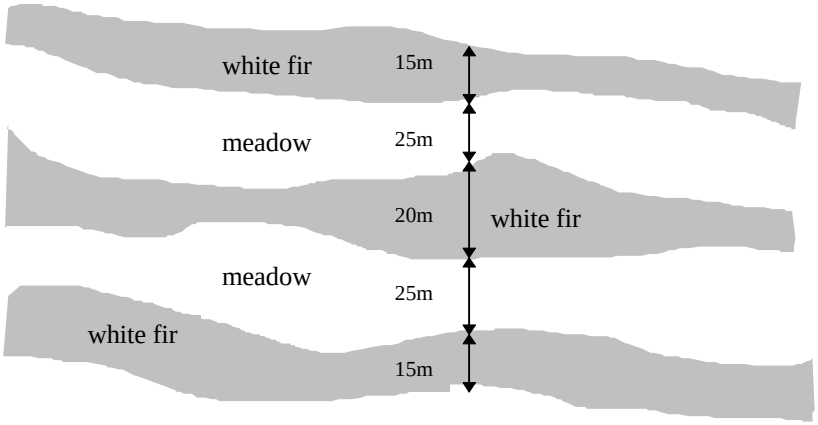
F) Stringers, intermingled vegetation and amputated vegetation ,etc.

a) Stringers and Necks.

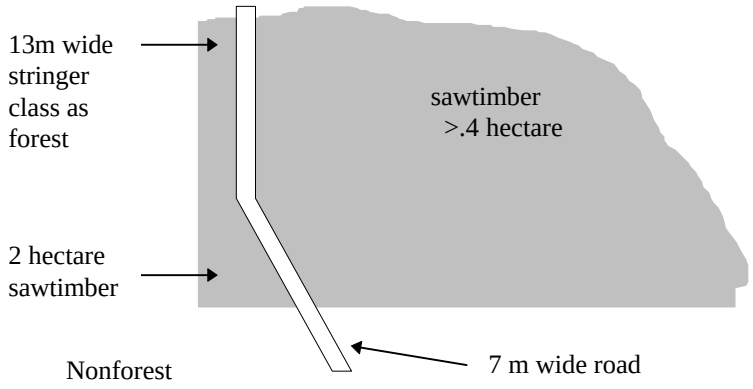
Even if they are distinct, boundaries between different condition classes are often not straight but consist of stringers and necks (see examples below). A stringer is at least 35 meters long; a neck is less than 35 meters in length. A stringer must be at least 35 meters in width to be identified with the condition class to which it is attached. If the stringer is less than 35 meters wide it will be identified with the surrounding condition class. A neck can be less than 35 meters wide to be identified with the condition class to which it is attached but it must also be less than 35 meters in length.



b) Intermingling of forest and other natural vegetation. When forest land strips are intermingled with other natural strips, each less than 35 m wide, classify as forest land and show the "other natural strips" as nonforest inclusions where they cross the 17 meter subplot (see page 27).



c) Land amputated by a cultural nonforest stringer. When a forest strip which is less than 35 meters wide is isolated from adjoining forest by a cultural nonforest stringer which is also less than 35 meters wide, classify the strip as forest if the adjoining forest is at least 35 meters wide and .4 hectare in size. In the example below, if the cultural nonforest stringer were greater than or equal to 35 meters, the isolated strip would be classified as nonforest.



D. Subplot numbering.

1. Numbering for plots which were established at OCC 2:

In l981-84 (Occasion 2), a 5.5-kilometer grid was established across all ownerships. New 5-point field plots were established at each timberland grid location and at every fourth oak woodland, pinyon juniper, and chaparral location (11 k grid). At Occasion 2, care was taken to insure that all 5 points fell in a single land class and, if timberland, in a single stand condition. Points were moved or substituted as necessary to insure that condition class boundaries were not crossed. At Occasion 3, plots are laid out in a predetermined pattern, regardless of condition class. When the new subplot coincides with the old point, the old subplots are remeasured (##) when they are in condition class 1. When a point had been previously moved away from a condition class boundary, the new subplot (N#) is allowed to straddle the boundary and the old subplot (R#) is remeasured for use in change estimation. If the subplot had been substituted at OCC 2, a new subplot is established in the predetermined pattern. If the condition is the same as the condition at subplot 1 center (at both OCC 2 and OCC 3) and is not a new clearcut then the new subplot is reconstructed to provide change information between OCC 2 and OCC 3 (C#). If the condition class is different than the condition at subplot 1 center at either OCC 2 or OCC 3 or is a new clearcut then no reconstruction is attempted (N#).

1(a) Numbering access denied subplots which were established at OCC 2.

When a crew is denied access or encounters a situation that the crew considers too dangerous to do the plot, subplots that were forested and measured at OCC 2 will be projected when they are in the same ground land class as the ground land class of subplot center 1 (P#). If the ground land class is different from the ground land class at subplot 1 center at either OCC 2 or OCC 3, then no projection is attempted (N#). Note that the "plot layout" will not always be the standard plot layout. If subplots were substituted because of forest stand condition at OCC 2, they will "remain in their positions" and be called P# subplots if they have the same ground land class as the ground land class of subplot center 1. However, subplots which were substituted because of ground land class at OCC 2 will be "laid out to the north in the standard plot layout" (that is, with a template) and be called N# subplots.

2. Numbering for plots which are being measured for the first time at OCC 3:

If a whole plot is being measured for the first time at OCC 3, subplots in condition class 1 are reconstructed (C#). If the condition class is different than the condition at subplot 1 center, or is a new clearcut, then no reconstruction is attempted (N#).

Below are the 5 different types of subplot centers:

1) ## subplots. All subplots in condition class 1 which were established at OCC 2 and were neither moved nor substituted at OCC 2. All subplots in condition class 1 at OCC 3 which were in the same ground land class as point 1 at OCC 2. The 2-digit code is the OCC 2 point number followed by the OCC 3 subplot number (e.g. 11, 22, 33, 44, 55). Note: An oak-woodland subplot 5 will be numbered "25" if it was on an OCC 2 3-point plot, was neither moved nor substituted at OCC 2 and it is to be remeasured (see page 25).

2) R# subplots. All subplots in condition class 1 which were moved (not substituted) at OCC 2. The 2-digit code is the character R followed by the OCC 3 subplot number.

3) C# subplots. All newly established subplots in condition class 1 at OCC 3 which were in the same condition class as point 1 at OCC 2 and are not associated with an R subplot and are not in a new clearcut. The 2-digit code is the character C followed by the subplot number.

4) N# subplots. All subplots in condition classes 2-5. All new subplots in condition class 1 which have an R subplot associated with them. All new subplots in condition class 1 which are not associated with an R subplot but which are in a new clearcut. The 2-digit code is the character N followed by the subplot number.

5) P# subplots. All access-denied subplots in condition class 1. The 2-digit code is the character P followed by the subplot number. Access-denied subplots in ground land classes other than condition class 1 ground land class will be N# subplots.

E. Referencing

1) Referencing the plot. For every plot measured on the ground, a reference point (RP) must be selected, and the section on the Plot Record labeled "Location Description" must be completed. You may also select and label a point-of-departure (POD) if you feel it would provide useful additional information for relocating the plot.

a) The reference point (RP). The RP is an object (usually a tree) that can be located on the ground and identified on the photo, and that will be useful for plot relocation in future inventories.

Selecting an RP : The RP should be distinctive on both the ground and on the OCC 3 photos. On remeasurement plots, you may reuse the OCC 2 RP tree if it is suitable. If the old RP tree is dead, missing, or difficult to identify on the ground or on the plot photo, select a new RP. If possible, it should be a tree which is not likely to die or be cut before the next inventory. You may select a snag or other object for an RP (e.g., a distinctive fence post, building corner, telephone pole, etc.). If you use such an object, describe it on the plot photo and area attribute record.

Tag the RP tree. Mark the RP tree, whether tags are reused or new . Nail aluminum plot tags on two or more sides of the RP tree, 2 meters above ground line, facing directions you expect future crews to approach the RP. Also nail an aluminum plot tag on the RP tree below stump height, on the side of the tree facing subplot 1. When attaching the tags, drive nails into the tree at an upward angle and always leave at least 5 centimeters of nail exposed.

Pinpricking the RP tree location. Pinprick the RP on the OCC 3 photos (UNLESS the RP pinprick would obliterate the subplot 1 center pinprick). Use the field photos (larger scale) where available, otherwise pinprick RP on the OCC 3 PI photos. Using a pencil, circle the RP pinprick on the back of the photo and write "RP" and the plot number near the circle (but not too close to the pinprick!).

Plots with subplot 1 as non-forest. When subplot 1 center falls in non-forest, determine whether a condition class boundary intersects the 17 m subplot. If a boundary is present and if the adjacent condition is timberland (GLC 20), or low productivity forest land (GLC 49), or oak woodland (GLC 44) on the 11 k grid, tally any trees that are "in" with the prism or on the fixed radius, reference the subplot, and map the condition class boundary on the 17 meter subplot diagram. Otherwise, proceed to the next lowest numbered subplot that may have forest tally in GLC 20, 49 or 44 on the 11K grid. Reference, with a stake and an RP tree, the first subplot center encountered in numerical order that is in part timberland (GLC 20), or low productivity forest (GLC 49) or oak woodland (GLC 44) on the 11 k grid. Mark appropriately on the OCC 3 photos and include in the plot location description.

b) Recording the RP tree data. Record the species, dbh (to the nearest cm), azimuth, and slope distance (to the nearest meter from RP to subplot 1) under "Plot Reference" on the Plot Record.

In the "Location Description" section on the Plot Record, record any information that would facilitate relocating the plot. Describe the subplot 1 location in terms of features that are unlikely to change before the next remeasurement. Include such items as slope, aspect, topographic position, and prominent features. In short, record observations in a way that will be of the most help to the OCC 4 field crew.

Example: "RP is a large redwood (over 60 meters tall) in draw that leads north from improved logging road. It's directly uphill from a large tanoak on subplot N1."

c) The point-of-departure (POD) (optional). On one of the OCC 3 photos, pinprick your point-of-departure (POD). This is the spot where you leave the established road and begin traveling cross-country. Circle the pinprick in pencil on the back of the photo and mark the circle "POD" on the photo back. Select a POD and route of travel that will facilitate relocating the plot. For this reason, it is better to pinprick the POD after the plot has been located and you have familiarized yourself with the area.

In the "Location Description" section on the Plot Record, describe how you reached the plot from the POD. Explain your route in terms of azimuth traveled; whether you walked uphill, downhill, or on the contour; any recognizable physiographical features (e.g. streams, rock outcrops, benches) you passed along the way. If any new roads have been built in the area since the date of the OCC 3 photos, sketch them on the photos if it will help the OCC 4 field crew relocate the plot.

2) Referencing subplot 1

a) Pinpricking the subplot 1 location. The OCC 3 PI photos in Trinity County only will have the subplot 1 location pinpricked in the office. When you arrive at subplot 1 on the ground, compare that location to the pinprick on the OCC 3 photos. Make sure the pinpricked location of OCC 1, OCC 2 and OCC 3 agrees with the ground location of the plot. If the pinprick is greater than 2 mm photo distance from the correct ground location (or not usable for finding the plot again), pinprick the correct location.

Plots for all other counties will have OCC 3 plot photos with a red dot approximating the plot center. Where there are OCC 3 plot photos, mark the subplot 1 location on the back of the photos, otherwise use the PI photos. Use a pencil to circle the pinprick and write PC (for "plot center") and the plot number near the circle.

b) Referencing the subplot 1 location (or subplot 2-5 if no part of subplot 1 is timberland (GLC 20), low productivity forest land (GLC 49) or oak woodland (GLC 44) on the 11K grid).

1) Pound a cedar stake in the ground at the pinprick location. On remeasurement plots, replace the old cedar stake.

2) Select two trees near the stake that form, as close as available, a right angle with the stake and each other. If the OCC 2 references for subplot 1 meet this criterion, reuse them. If you select new subplot 1 references, you may remove the square tags from the OCC 2 references to avoid confusing the OCC 4 crew, or you may leave the tags on in order to increase "visability" for the OCC 4 crew. If the tags are left on the old reference trees, be sure to accurately record the new reference trees. Trees within 2 meters of the stake are preferable. If trees are not available, you may use stumps.

3) Nail a square aluminum tag below stump height (<0.1m above the ground) on each tree on the side facing the stake at point center. Leave at least 5 cm of the nail exposed. If the trees are also numbered tally trees, attach the tree number tags with the same nails.

4) In two locations on each reference tree, nail a round disc 2 meters high facing likely approaches to the subplot .

3) Referencing all other subplots. Reference all subplots where timberland (GLC 20), low productivity forest (GLC 49) or oak woodland (GLC 44) on the 11K grid is present on the 17 m subplot (unless physically impossible). Use the following instructions:

a) Marking subplot center. Mark subplot center with a metal pin and round on subplots which include forest land and on nonforest land where possible.

b) Selecting reference trees. Select 2 trees near the pin that form, as close as available, a right angle with the pin and each other. Trees within 2 meters of the pin are preferred. If trees are not available, you may use stumps. On remeasurement subplots, either use the previous references, or replace if better ones are available. Renew old reference tags as needed.

c) Marking reference trees.

1) Tally trees. Nail an aluminum round to each reference tree, 2 meters above ground line, facing the direction you expect future crews to approach the subplot. If the tree is not a numbered tree, also nail an aluminum round below stump height, facing the subplot center.
2) Non-tally trees. Mark all trees 7.5 cm dbh and larger with an aluminum nail at the height that dbh is measured (see "Marking dbh" on page 163). Nail one aluminum round 2 meters above ground line, facing the direction you expect future crews to approach the subplot and nail one aluminum round below stump height facing the subplot center.

d) Recording reference trees.

1) Tally trees. If the reference trees are tally trees, indicate with an "R" after the tree history.
2) Non-tally trees. If the reference trees are not tally trees, complete a line for each in the Husky data recorder, as follows:

(1) Tree History = "9"
(2) Species code
(3) Dbh
(4) Azimuth
(5) Distance

3)For reference only trees, if > 7.5 cm dbh, place a nail where dbh was measured and measure as accurately as you would for tally trees. This is important because reference only trees may grow big enough to be tally trees at the next occasion.

II. PLANNING TRAVEL AND LOCATING THE PLOT

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II. PLANNING TRAVEL AND LOCATING THE PLOT

A. Landowner Contact

1. Permission

Either written or spoken landowner permission must be obtained before a plot is measured. This responsibility lies either with the field coordinator or the field crew.

In preparing for the field season, the Portland office sent each landowner of private-owned, non-timber industry plots (owner class codes 40 and 60) a letter describing our inventory and asking permission to measure the plot. (see Appendix 2). If the owner has responded, there will be a 3 x 5 card in the plot jacket. Owners of large land areas -- primarily private timber companies and public agenies -- are contacted individually by the Portland office and/or by field personnel. Access information for these plots will be provided.

2. Recording conversations with landowners

Ask landowners if they can confirm the dates of any disturbance on the land since OCC 2 and record this date on the Plot Attribute Record. Record any special circumstances about plot accessibility -- such as locked gates or washed-out roads on the Plot Record.

B. Before leaving base camp.

(1) Make sure the landowner has been contacted (see page 10).

(2) Plan the route to the plot. Always select two or more extra plots to take along.

(3) Leave word of your plot locations and expected destinations.

(4) Make sure your vehicle has all of the necessary equipment and a plot map.

(5) Reach agreement with your partner(s) on a work procedure.

(6) Inspect vehicle prior to departure.

C. Checklist of items needed on plot.

OCC 1 plot records and photos	
Plot jacket (OCC 2 & OCC 3 plot records & photos, subplot diagram)	
Hand-held data recorder downloaded with plots & extra batteries (AA)	
Mechanical pencils (.5mm/.9mm), red pen, black pen, eraser	
Note pad(s) "write-in-the-rain"	
Calculator	DATA RECORDING
Tatum and tatum aids	
Field manual(s), data recorder manual	
Residue pile tally sheets	
Extra CWD tally sheets	
Hardcopy of tally sheets	
Plant guide(s), plant disease guide	
Plot (road) map	
Stereoscope(s) (2x and/or 4x) with case and straight pins	
Photo scale (Timber Survey Aid #16))	
Ruler (15cm)	PHOTO INTERPRETATION
Pinprick(s)	
Hand lens	
Prism(s) 7BAF	
Compass(es)	
Clinometer(s)	
Diameter tape(s)-7.5 m	PLOT MEASURING
30-meter tape(s) with carabiner(s)	
Hand axe(s) with sheath	
Increment borer(s) with sheath	
Paper bags for root disease samples	
Cedar stake	
Steel plot pins	
Nails	
Tree number tags	PLOT REFERENCING
Square tags	
Round tags	
Flagging tape	
First aid kits	FIRST AID
Bee sting and/or snake bite kits	
Canteens	
Lunches	MISC. PERSONAL
Utility pouch	
Vest, hardhat, rain gear, gloves and extra clothing	

D. Safety. Personnel working in the field are subject to many safety hazards. Each person must always be conscious of these hazards to avoid accidents. DON'T TAKE CHANCES! ELIMINATE HORSEPLAY AND CARELESSNESS! THINK SAFETY! Remember: no task is more important than personal safety!

1. Safety in the woods:

a) Wear protective clothing. Long-sleeved shirts, long pants, and gloves may protect you from contact with cutting brush and rocks, poison oak, and stinging insects. Trouser legs should be loose enough to avoid binding or cramping, and should not have cuffs. Wear a hardhat at all times in the woods. During hunting seasons wear bright red or orange clothing.

b) Wear good quality boots with good traction. For example: 8-inch high leather work boots with lug-soles (Vibram soles).

c) Walk, don't run in the woods. Take your time and plan your route. Avoid plunging through the brush. The best route of travel may not be the shortest. Routes across brushy, irregular terrain with rocks and down logs can be hazardous.

d) Be watchful of twigs and branches which may cause eye injury. Be especially alert when stepping up to trees which retain their small dead twigs. Keep a sufficient distance behind the person ahead of you to avoid being slapped by branches.

e) In heavy undergrowth or slash, lift knees high to clear obstacles. Slow down and watch your step.

f) When contouring a steep slope, do not lean into the hill. This tends to loosen footing. Erect posture or slightly leaning out gives more secure footing.

g) Know how to fall to avoid hard impacts. Keep flexible with knees slightly bent. If you feel yourself slipping, pick a landing spot. "Do not" stick your arms out to break a fall. Roll with the fall. Try to take the impact on the side of your body rather than your back.

h) Don't take chances by walking across ravines, etc., on small logs.

i) Bee aware. Keep an eye out for yellow jacket and hornet activity. Yellow jackets nest in the ground, often in well-decayed logs. Yellow jackets are particularily active (nasty) during late summer and early fall when forest conditions are very dry. Hornets nest above ground in "paper" nests that are suspended from branches; woe befalls those who unwittingly bump their head against a nest, or shake the sapling from which a nest is suspended. If allergic to insect stings, carry medication to counteract the effects of stings.

j) Be alert to rattling or buzzing noises. Look before putting hands or feet on or under rocks and logs. Be alert when walking in snake-infested areas.

k) Avoid poison oak, if possible. Place oil on exposed skin before going to field. After contact with poison oak, remove clothes carefully, wash exposed areas with cool, soapy water, and wash clothes before wearing them again.

l) Keep someone posted as to where you plan to work each day, particularly on long hikes into the forest, so that if you do not return in a reasonable time, someone can find you.

m) Hand axe. Carry it in the sheath except when actually using it, and snap the sheath shut.

n) Keep individual first-aid kit completely supplied, and know how to use it. Treat all wounds promptly. See that a completely supplied large first-aid kit is in each vehicle.

o) Carry matches and possibly a small flashlight. On very long hikes, take extra food, clothing, and matches in case you are caught out in the woods at night. Never build fires in forest duff or leave a campfire until it is dead out.

p) Check for ticks. The beasties bite and carry Lyme disease.

q) Carry plenty of water. Don't expect your partner to carry water for you.

2. Safety on the road: It all pays the same, so drive with care, with courtesy regardless of others' actions, and with common sense.

a) Seatbelt use is required in all government-owned or leased vehicles, and it is the law in the State of California. Do not ride in the back of pick-ups.

b) DRIVE DEFENSIVELY! Expect the other person, whether vehicle or pedestrian, to do the worst thing and be prepared. Observe all speed regulations and traffic signs.

c) Do not drive when sleepy, taking medication, or when other personal conditions make it unsafe to drive a vehicle. Get someone else to drive or, if alone, stop driving and nap (out of the public view).

d) Always drive with your headlights on. This practice increases the visibility of your vehicle. It is particularly important when driving in fog, on dusty roads, traveling in and out of shadows, and any other low light/visibility situations. Turn lights off when you park the vehicle.

e) Do not operate a vehicle in an unsafe condition. Check your vehicle frequently to keep it in good mechanical condition. Lights, horn, steering, and brakes should be kept in proper adjustment at all times. Make necessary repairs as soon as unsafe condition develops. Check canopy attachment often. Report any unsafe conditions to your supervisor.

f) Keep the vehicle clean; windows, mirrors, and lights should be kept

clean and free of obstructions to increase visiblity; keep cab and driver area clean so material is not rolling under pedals or otherwise distracting the driver.

g) When descending long steep grades shift to a lower gear at the beginning of the grade.

h) Adjust vehicle speed to the driving conditions. Wet, icy, or snowy roads and decreased visibility require decreased speed. Be aware of speed when changing from one type of road to another, i.e., Freeway to secondary highway to gravel and adjust speed accordingly.

i) When following other vehicles allow at least three seconds of travel distance between yourself and the vehicles ahead. Under slippery road conditions and poor visibility allow more distance.

j) Be aware of your vehicle's idiosyncrasies and adjust your driving accordingly.

k) When driving on privately-owned log-haul roads, be alert for heavily loaded trucks moving at high speeds. Observe all traffic control signs, particularly signs requiring you to drive on the LEFT side of the road.

l) When backing up walk around your vehicle to check for hazards and use a spotter to guide you.

m) Do not drive and navigate at the same time. If the driver needs to look at maps and photos, stop at a safe place, then look at them.

n) Watch for animals on the road. Most hoofed animals travel in groups, so where there is one, assume there are many, with all just itching to jump out in front of your vehicle. Stop and let the animal move off the road, look for others to follow, then proceed on. If you can not stop in time to avoid hitting an animal, it is generally better to hit it, than to go off the road or hit another vehicle.

o) Park your vehicle so that it does not pose a hazard for other drivers. Do not park where dry grass or other potential fuels come in contact with your vehicle's hot exhaust system.

p) Keep as far right as is safely possible on blind curves on logging roads. If the curve is blind and less than two lanes wide, slow way down and be ready to take evasion action.

3. What to do if injured:

a) Treat the injury promptly; if immediate medical attention is required, go directly to a hospital emergency room. Try to make contact with your supervisor or the office to get instructions and assistance. Make sure the doctor fills out his/her part on the CA-1 form.

b) Inform your supervisor of all injuries and ask which, if any forms, need to be filled out. Supervisors must inform the office at the earliest opportunity.

c) Fill out Federal accident forms completely, with signatures, and make a copy for your personnel records. Give the forms to your supervisor and they will check for mistakes, fill out their section, and send them to the appropriate person.

d) If you are in a multi-vehicle accident, provide other parties with enough written information so that they can easily get in touch with you, your crew supervisor, and the office. In turn, you must get the following information from all involved parties and witnesses: names, addresses, phone numbers, vehicle license numbers, driver's license numbers, insurance company names and policy numbers, and police report numbers. If possible, do not admit responsibility without first contacting your supervisor.

E. Plot location aids.

Each field crew should have a road map covering the general plot area and a plot packet for each plot you plan to visit. The plot packets, which were assembled in the Portland office for each field plot, contain: the OCC 1, OCC 2 and OCC 3 photos; plot records with plot diagrams; computer-printed plot and subplot attribute records; computer-printed tree tally records.

You may use the road map, plot cards from OCC 1, 2, and 3, and aerial photos to locate the plot. The county, plot number, and legal description (township, range, section, and forty) are printed on the plot attribute record. Plot locations are marked and numbered on the plot map. Use the plot map to reach the general vicinity of the plot by motor vehicle. Once you have reached the plot covered by the photos, you may use the photos to find the exact plot location on the ground.

For remeasurement plots, the plot location is pinpricked and circled on the OCC 2 photos. The plot number is marked in the upper right-hand corner on the front of the old photo, and on the backside near the circled pinprick. Many of the OCC 1 photos have true azimuth and photo scale determined on the backside. The plot number is also marked on the upper right-hand corner of the new photos. For remeasured plots, the OCC 2 plot card has a section "Route to RP" which sometimes provides information useful for locating the plot.

All plots will have OCC 3 PI photos with the plots pinpricked or circled on them. Where possible, larger scale OCC 3 photos for plot location will be included. On these photos the plot area will be circled and marked with a red dot. The field crew will pinprick these photos. (See "Pinpricking subplot 1 location", page 51)

F. Locating the plot on the ground.

1. Previously measured plots. When revisiting established plots, use both new and old photos to proceed to the plot area. It is often easier to use the OCC 3 photos to arrive at the general location and the OCC 1 and 2 photos to find the exact location of the plot. It is generally easier to locate an established plot by heading directly to the plot center rather than to the RP. The reason: the RP is a single tree with a couple of tags, whereas within the plot area are several to many trees with reference tags, tree numbers and/or diameter nails; in short, more "signs" to detect. In searching out the plot, you may find a tagged/numbered tree on one of the subplots--use the OCC 2 plot card to determine which sample subplot you are on. Note: on the OCC 1 plot card, the azimuths recorded for subplot 1 reference trees are from tree to subplot center.

The RP tree has square aluminum tags on two sides of the tree, 2 meters above ground line, and one square aluminum tag below stump height facing towards the field grid location. If needed, travel notes, remarks, and a description of the RP trees can be found on the front of the OCC 2 tally sheet and the back of the OCC 2 photo. Before beginning the traverse from the RP to the plot, check the photos to see if the azimuth and distance seem reasonable. Some photos will be marked with a point-of-departure (POD). They are usually near a road and indicate how the crew arrived at the plot area. If you are having difficulty finding the plot, follow these steps:

a) Return to the last known point on your route into the plot. Plan a route to the pinpricked field grid location; divide the route into stages with an identifiable physical feature at the end of each stage that you can identify on the photos and can find and confirm on the ground. Proceed stage by stage, never embarking on the next stage until you know without a doubt that you have identified the endpoint of the previous stage. The endpoint on the last stage is the pinpricked location with its referenced trees.

b) If you tracked your way into the plot area but you find don not any signs of the plot, look for stream confluences, ridges, openings, groups of large trees, old skid roads, large snags etc. on the ground, to reconfirm without a doubt that you are at the pinpricked location.

c) Still no plot? Try to locate the area that previous crews might have been when they thought they were at the pinpricked location. Check the OCC 2 plot card for information such as:

(1) Remarks which say "Point center moved back 20 feet on same azimuth to agree with photo pinprick."

(2) Stand type and size of trees. If the plot is in large sawtimber stand of fir, the crew would know they were off if they were in a pole stand of pine.

(3) The size and species of the RP and point 1 reference trees.

(4) Direction of travel from the RP--it could be 180 degrees off.

(5) Any other indicator such as slope and aspect.

2. New plots.

a) Locating a plot by inspection. For plots not established at OCC 2, and that have no previous photo coverage, use the OCC 3 photos to proceed to the pinpricked location by photo interpretation. If a crew ground-checked the plot at OCC 2, they may have recorded information on the OCC 2 plot card which could be helpful in relocating the plot. When you reach the point you believe is the pinpricked location, carefully check the photos against the surrounding terrain and vegetation to make sure you are in the correct spot.

b) Locating a plot with an RP and baseline. You may encounter a plot that is difficult to locate using photo interpretation. In this case you may establish a baseline on the OCC 3 photos to determine true photo azimuth and scale. Once the baseline is established:

(1) Select, tag, pinprick, and measure an RP, preferrably within 200 m of the plot.(See page 47).

(2) On the photos, draw a straight line between the RP and pinpricked location.

(3) Determine the azimuth and distance from the RP to the plot using Timber Aid #16.

(4) Measure out the calculated azimuth and distance to the pinprick location and flag it. Carefully check the photos against the surrounding terrain and vegetation to make sure you are actually in the correct spot. When the pinprick location on the ground is determined, locate subplot N1 with a cedar stake to begin the plot.

G. Plots with active logging.

If you arrive at a plot location and find the area is being logged (timber has been or is being felled, bucked, or yarded), DO NOT ESTABLISH THE PLOT. Note on the plot jacket the status of the logging operation and return the plot to the field coordinator. The field coordinator will hold the plot until later in the season, when the status of the logging operation will be checked again to see if the plot can be completed.

APPENDICES

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APPENDIX - 1

FIELD CREW EDIT

Thorough field data editing involves periodic review of the data during and between various collection procedures. The field crew is the primary focus in the edit process, which begins while measuring the plot. When plots are recorded on paper, data entry must be neat, ledgible, and all spaces filled with one digit only.

1. Before leaving the subplot: At each subplot, make sure that all required items are completed and correctly updated. If tallied on paper, have the estimator check over the plot record before leaving the subplot. Items to check include, but are not limited to:

a) Make sure the condition class for each tree matched the subplot diagrams.

b) Two references per subplot (where reasonable).

c) Tree number updated for OCC 2 trees that were given new numbers

d) OCC 2 dbh, azimuth, and distance updated if unacceptably different from the OCC 3 measurement.

e)Tree history changed for dead trees, and mortality trees entered again as snags with same line number (if they qualify)

f) Kind of "cull other" noted in remarks where coded

g) Vegetation profile reviewed for completeness and correctness of codes

h) Coarse woody debris tally reviewed for completeness

2. Before leaving the plot: Complete all required items on Plot Record, and Subplot Diagrams and Plot Jacket. When the plot is tallied on paper, all items required by the tally guide must be completed and all spaces must have only one digit.

a) Check photos to see if properly labeled and pinpricked (POD,RP,PC). Make sure photo number is correct on Plot Record.

b) Estimator, recorder, date and Husky ID are complete. Location description is more than adequate.

c.) Present condition/past disturbance is complete with all necessary situations explained.

d.) Plot diagram complete. Subplots numbered correctly.

e.) All Field-Interactive Items completed.

f.) Complete plot jacket label. Make sure owner requests are noted..

3. After printing the plot hardcopy. The plot is dumped from the data recorder. With the hardcopy in hand, the following edit should be done:

A. Photograph, Plot Diagram, Subplot Numbers, Condition Class

All plots

1. Check the photo. Is the RP pinpricked and labeled? Does it agree with the information on the Plot Record? Is the location description adequate?

2. Check the plot diagram and the subplot numbers on

    1. plot diagram
    2. 17 meter subplot diagrams
    3. tree tally
    4. coarse woody debris
    5. vegetation
    6. subplot attribute record

3. Check condition class on Plot Record map and in Plot description.

4. Check condition class against 1st digit of tree history on tree tally.

5. Check that "% in condition class" on Subplot Attribute Record is filled out for each subplot.

Plots with Mapping on the 17 meter subplot diagrams

6. Check condition class against condition class maps, make sure all condition classes are represented on subplot diagrams.

7. Check condition class against Plot Attribute Record, make sure all condition classes are represented

8. Check condition class diagrams for nonstockable areas, make sure all areas on diagrams are recorded

9. Make sure condition class meets minimum area requirements, forest stand condition must be at least 2.5 ha.

10. Dot count on condition class subplot diagrams must match % in in condition class on Subplot Attribute Record.

11. Check that the tree tally reflects a change in condition class, if more than one condition class is recorded make sure there is a change in tree size or types between condition classes.

12. On sliver condition classes, make sure forest type, stand age and stand size class are recorded on Subplot Attribute Record.

B. Plot Attribute Record

1. Check sample kind and ground land class for all condition classes.

2. Check that condition classes, kind of disturbance and silviculture treatment match plot description on Plot Record.

3. Check site index data against tree tally. If index discrepancy of more than 30, either explain in Present Condition/Past Disturbance or delete. If fewer than 3 site trees, check against tree tally. Have any possible site trees been overlooked?

C. Subplot Attribute Record

1. Check that each subplot has a condition class number.

2. Check that Nonstockable, Root Disease and % in Condition Class match 17 m subplot diagrams. Make sure root disease is code for root disease and not some other fungus.

3. Check that % in Condition Class is filled out for each subplot.

4. Check seedling count against seedling tally. Seedling count may be greater than seedling tally, but seedling tally may not be greater than seedling count.

5. Check for uncoded/miscoded plants.

D. Tree Tally

1. Tree history 4. Given OCC 3 height, dbh, and age, is it reasonable that this tree was a seedling at OCC 2 or non-existent at OCC 2.

2. Tree history 6 on 3.3 m fixed radius. Given OCC 3 height, dbh and age is it reasonable that this tree was a sapling at OCC 2.

3. If both tree histories 4 and 6 on the same subplot on similar trees, give explanation in Present Condition/Past Disturbance.

E. Problem Access

1. If a problem access plot, make sure a separate sheet of paper documents contacts or problems including dates, and who made the contacts.

APPENDIX - 2-A
SAMPLE LANDOWNER LETTER
(forested plots)

United States Department of Agriculture | Forest Service | Pacific Northwest Research Station | 1221 S.W. Yamhill P.O. Box 3890 Portland, OR 97208-3890

Date: April 29, 1992

The Pacific Northwest Research Station is inventorying the forests of California to gain basic information used by researchers, planners, and the interested public. This information will help to answer questions concerning the amount, condition, and trends of California's forest resources and is important to wise planning for the State's future.

The inventory data is collected every 10 years from permanent inventory plots located on a 3.4-mile grid across California. Most of these inventory plots were visited in 1981/1982, though some are being visited for the first time this inventory cycle. County ownership records show that one of these plots falls on or near your land. The approximate location of this plot is T ,R , Sec. , . We ask your permission to enter or cross your land to measure the vegetation on this plot.

The data we collect from the plot on your land is combined with data from many other plots to provide information about forest resources for all of California, and will not be identified in any way with your name or property and will have no bearing on your property taxes. The collected data are summarized, analyzed, interpreted, and published in statistical and analytical reports for the U.S., for California, and for various geographic areas within California. We enclose a table on area and one on timber volume as a sample of the statistics we produced from our 1981-82 inventory of the northern interior of California. In addition, to show how California inventory data fits in with forest statistics for the whole country, we enclose a table we recently published on land area in the U.S. by major land class.

Our field staff will be in your area between May 1 and October 30. If you wish, they will contact you before entering your land. If there is anyone we need to contact for access information such as locked gates, or if you have any other concerns, please contact us. A stamped card and a release are enclosed. The signed release statement relieves you of responsibility in the unlikely event our field people injure themselves while on your property.

If you have any questions, please contact Dale Baer at 503-321-5852 or after June 15 contact Tom Farrenkopf at 503-321-5885 for additional information. Thank you for your cooperation.

Sincerely,

DANIEL D. OSWALD
Program Manager
Inventory and Economics

APPENDIX - 2-B

SAMPLE RELEASE LETTER

R E L E A S E

The UNITED STATES FOREST SERVICE assumes liability for any damages caused by negligence of Forest Service personnel while entering upon or leaving (landowner name) property in connection with the reinventory of timber in the State of California, and (landowner) shall be held harmless for any liability cost or damage from injuries occurring to Forest Service personnel for any reason except the negligent or wrongful acts of (landowner name) while they are on the property owned or controlled by (landowner name).

DANIEL D. OSWALD
Program Manager
Inventory and Economics
Pacific Northwest Research Station
US Department of Agriculture

APPENDIX - 2-E

PLEASE CHECK BOXES

I give permission to revisit the plot on my land.

You will need information about access to my property and can contact me at:

Name_____
Phone Number_____
Address_____
_____

APPENDIX - 3
CHECK PLOT PROCEDURES

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APPENDIX - 3
CHECK PLOT PROCEDURES

A. Objectives. Check plots are performed for several purposes:

1) To measure the accuracy of collected data;

2) To ensure that procedures for field plot measurement are uniformly understood and consistently followed;

3) To inform data collectors of the required accuracy standards;

4) To provide incentive to do excellent work.

B. Check plot policies. The following policies for conducting check plots will be followed:

1) Each person will be checked within the first two weeks of field work and will accompany the checkplotter on his/her first check plot.

2) Check plots will continue during the entire season so that each person is checked 4-5 times during the field season.

3) All check plot items count equally for each person who was on the plot.

C. Check plot procedures.

1. In the field, the check plotter checks all of the tree classifications/ measurements. The check plotter or assistant (one of the crew members on the original plot) makes all of the tree measurements, directly comparing them to the data on the data recorder hardcopy. Items that are outside the accuracy limits are rechecked. Final decisions on accuracy rest with the check plotter. Errors are circled in red on the original tally sheet, and the correct value written near the circle.

2. Completing the check plot form. Field plot items are organized into 14 categories on the check plot form. The percent correct in each of the categories is calculated by dividing the number of correct items by the total number of items.

Each category is rated as (1) outstanding, (2) acceptable, or (3) less than acceptable, based on the accuracy standards indicated on the form.

For an overall rating of outstanding, items 1,2,3,4 and 9 must be outstanding and no items can be unacceptable.

For an overall rating of acceptable, items 1,2,3,4 and 9 must be acceptable and no more than 2 items can be unacceptable.

CHECK PLOT FORM

County_____Plot #_____Crew_____Date_____

Checked by_____Date_____

1. PLOT LOCATION

To receive Outstanding:
(A) If remeasurement, the plot must be relocated. (B) If new the plot must be within type and +/- 5m. (C) Total = 100%

To receive Acceptable:
(A) If remeasurement, the plot must be relocated. (B) If new, the plot must be within +/- 10m. (C) Total = 90%

	# Correct/Out of
a.) Remeasurement-relocated.....	_____
b.) New-correctly located.....	_____
c.) Occ 2,and 3 pinpricks in same correct spot and labeled.....	_____
d.) RP tagged,pinpricked,labeled and described.....	_____
e.) RP azimuth +/- 4 degrees, distance-plot must be findable 10 yrs from now (judgment of checkers) and +/- 5%.....	_____
Total -- %	_____ ____%

2. PLOT LAYOUT

To receive Outstanding:
(A) All subplots correctly numbered (B) All condition class boundaries correctly drawn (c) Total = 100%

To receive Acceptable:
(A) Total = 95%

	# Correct/Out of
a.) Subplots correctly numbered	_____
b.) Diagram accurate, condition class boundaries correct.....	_____
c.) References tagged and recorded. Az +/- 4 degrees, distances +/- 20cm (total possible = 8).....	_____
Total -- %	_____ ____%

3. TRACKABLE TREE PRISM TALLY

To receive Outstanding-100% To receive Acceptable-98%

	# Correct/Out of
a.) Prism tally.....	_____
Total - %	_____ ____%

4.TRACKABLE TREE FIXED RADIUS TALLY

To receive Outstanding-100% To receive Acceptable-98%

	# Correct/Out of	
a.) Fixed radius tally.....	_____	
Total - %	_____	____%

5. SITE TREE SELECTION/PLANT INDICATORS (if needed)

To receive Outstanding-95% To receive Acceptable-90%

	# Correct/Out of	
a.) Site tree selection fits model for each tree.....	_____	
b.) Site tree height and age meet standards.....	_____	
c.) Plant indicator species correctly recognized.....	_____	
Total - %	_____	____%

6. TREE HISTORY AND SPECIES

To receive Outstanding-100% To receive Acceptable-98%

	# Correct/Out of	
a.) Tree condition class and history.....	_____	
b.) Tree species.....	_____	
Total - %.....	_____	____%

7. HEIGHT AND DBH-TRACKABLE TREES

To receive Outstanding-95% To receive Acceptable-88%

	# Correct/Out of	
a.) Height normally formed up to 20m tall +/- 1m.....	_____	
b.) Height normally formed 21m + +/- 4%.....	_____	
c.) Dbh +/- 20mm per 50cm.....	_____	
Total - %.....	_____	____%

8. SNAG TALLY

To receive Outstanding-95% To receive Acceptable-90%

	# Correct/Out of	
a.) Snag tally.....	_____	
b.) Dbh +/- 10%.....	_____	
c.) Height +/- 10%.....	_____	
d.) Use or disappearance correct.....	_____	
e.) Decay class +/- 1 class.....	_____	
Total - %.....	_____	____%

9. CONDITION CLASS

To receive Outstanding-100% To be acceptable-95%
To receive Outstanding or Acceptable (a) and (f) must be 100%

	% Correct/Out of	
a.) Condition class correctly recognized.....	_____	
b.) Condition classes mapped on 17-m subplot diag. correctly.....	_____	
c.) Az. +/- 4 degress; Distances +/- .5 m to distinct boundary	_____	
d.) % of subplot in each condition class +/- 5%.....	_____	
e.) Sample kind of each condition class.....	_____	
f.) Ground land class of each condition class.....	_____	
g.) "Sliver" age (+/- 30 yrs.), type, stand size	_____	
Total - %.....	_____	____%

10. TREE IDENTIFICATION AND CLASSIFICATION

To receive Outstanding-95% To be Acceptable-90%

	# Correct/Out of	
a.) Height estimates in trees with missing parts +/- 2m.....	_____	
b.) Dbh nail height +/- 3cm, 2 or more nails in 75cm + trees.....	_____	
c.) Age-bored +/- 2 yr, estimated +/- 10%.....	_____	
d.) Crown ratio +/- 1 class.....	_____	
e.) Crown class: free to grow or not*.....	_____	
f.) Growth impactor or harvest code correct.....	_____	
g.) Mistletoe recognized +/- 2	_____	
h.) Cull other recognized +/- 10%.....	_____	
i.) Form class first 2.5 meter log straight or not**.....	_____	
j.) Cull rot recognized-- +/- 1 class.....	_____	
Total - %.....	_____	____%

11. SUBPLOT CLASSIFICATION

To receive Outstanding-95% To be Acceptable-90%

	# Correct/Out of
a.) Nonstockable, root rot-recognized +/- 15%.....	_____
b.) Total vegetation percent cover +/- 20%.....	_____
c.) % vegetation in condition class of subplot center +/- 10%	_____
d.) Vegetation correct identification and code.....	_____
e.) Vegetation percent cover per species +/- 15%.....	_____
f.) Vegetation layer and stage of development.....	_____
Total - %.....	_____

* For crown class crew will be marked off if they do not correctly distinguish between dominant-codominant and intermediate-suppressed trees.

** For form class crew will be marked off if they do not correctly recognize that the first 2.5 meter log of the tree is straight or not.

12. AREA CLASSIFICATION

To receive Outstanding-95% To be Acceptable-90%

	# Correct/Out of	
a.) Stream proximity +/- 5 meter, stream class correct.....	_____	
b.) Aspect +/- 1 class.....	_____	
c.) Slope +/- 15%.....	_____	
d.) Topographic position.....	_____	
f.) Plot description-land class, productivity, treatment, disease, layout, harvest, ownership class, etc addressed.....	_____	
Total - %.....	_____	____%

13. COARSE WOODY DEBRIS

To receive Outstanding-95% To be Acceptable-90%

	# Correct/Out of	
a.) Piece tally.....	_____	
b.) Intersection diameter +/- 10%.....	_____	
c.) Decay Class +/- 1 class.....	_____	
e.) Piles (shape code).....	_____	
Total - %.....	_____	____%

14. OTHER ITEMS NOT PREVIOUSLY COVERED (if needed-inspectors decision)

To receive Outstanding-100% To be Acceptable-95%

	# Correct/Out of	
a.).....	_____	
Total - %.....	_____	____%

TOTAL

OUTSTANDING ITEMS ACCEPTABLE ITEMS UNACCEPTABLE ITEMS

TOTAL CHECK PLOT: ACCEPTABLE -- UNACCEPTABLE (circle)

WRITE-UP_____

_____

_____

_____

_____

APPENDIX - 4
SLOPE CORRECTION TABLE

PERCENT	EXPANSION FACTOR	EXPANSION FACTOR RECIPROCAL 17 m	SLOPE DIST. FOR 30 m	SLOPE DIST. FOR 43 M	SLOPE DIST. FOR
10	1.005	1.00	17.0	30.2	42.8
15	1.010	.99	17.2	30.3	43.0
20	1.020	.98	17.3	30.6	43.4
25	1.031	.97	17.5	30.9	44.0
30	1.044	.96	17.7	31.3	44.4
35	1.060	.94	18.0	31.8	45.2
40	1.077	.93	18.3	32.3	45.8
45	1.097	.91	18.6	32.9	46.8
50	1.118	.89	19.0	33.5	47.6
55	1.141	.88	19.4	34.2	48.6
60	1.166	.86	19.8	35.0	49.6
65	1.194	.84	20.3	35.8	50.8
70	1.221	.82	20.8	36.6	52.0
75	1.250	.80	21.3	37.5	53.2
80	1.281	.78	22.8	38.4	54.6
85	1.312	.76	22.3	39.4	55.8
90	1.345	.74	22.9	40.4	57.2
95	1.379	.72	23.4	41.4	59.2
100	1.414	.70	24.0	42.4	60.2
105	1.450	.69	24.6	43.5	61.8
110	1.486	.67	25.3	44.6	63.4
115	1.524	.66	25.9	45.7	65.0
120	1.562	.64	26.5	46.9	66.6
125	1.601	.62	27.2	48.0	68.2
130	1.640	.61	27.9	49.2	69.8
135	1.680	.60	28.6	50.4	71.4
140	1.720	.58	29.2	51.6	73.2
145	1.761	.57	29.9	52.8	75.0
150	1.803	.55	30.7	54.1	76.8

APPENDIX - 5

HORIZONTAL LIMITING DISTANCES (METRIC) 7M BAF PRISM (F =0.18896)

DBH cm	Dist.m	DBH cm	Dist.m
0.1	.02	41	7.74
.2	.04	42	7.93
.3	.06	43	8.12
.4	.08	44	8.31
.5	.10	45	8.50
.6	.11	46	8.69
.7	.13	47	8.88
.8	.15	48	9.07
.9	.17	49	9.26
1	.19	50	9.45
2	.38	51	9.63
3	.57	52	9.82
4	.76	53	10.01
5	.94	54	10.20
6	1.13	55	10.39
7	1.32	56	10.58
8	1.51	57	10.77
9	1.70	58	10.96
10	1.89	59	11.15
11	2.08	60	11.33
12	2.27	61	11.52
13	2.46	62	11.71
14	2.64	63	11.90
15	2.83	64	12.09
16	3.02	65	12.28
17	3.21	66	12.47
18	3.40	67	12.66
19	3.59	68	12.85
20	3.78	69	13.03
21	3.97	70	13.22
22	4.16	71	13.41
23	4.34	72	13.60
24	4.53	73	13.79
25	4.72	74	13.98
26	4.91	75	14.17
27	5.10	76	14.36
28	5.29	77	14.55
29	5.48	78	14.73
30	5.67	79	14.92
31	5.86	80	15.11
32	6.04	81	15.30
33	6.23	82	15.49
34	6.42	83	15.68
35	6.61	84	15.87
36	6.80	85	16.06
37	6.99	86	16.25
38	7.18	87	16.43
39	7.37	88	16.62
40	7.56	89	16.81
		90	17.00

APPENDIX - 6
METRIC EQUIVALENTS

Length

1 inch = 2.54 centimeters (cm)
1 foot = 0.3048 meter (m)
1 mile = 1.609 kilometers (km)

Area

1 acre = 0.4 hectare (ha) (approximately)
5 acres = 2 hectares (ha) "
1,000 acres = 404.7 hectares (ha) (exactly)
1 hectare = 2.471 acres "

Volume

1,000 cubic feet = 28.3 cubic meters (m3)

1 cubic foot per acre = 0.07 cubic meter per hectare (m3/ha)

APPENDIX - 7
OCC 2 CODES FOR DAMAGE/CAUSE OF DEATH

(1) Damage/cause of death.

Cause of death--(recorded for dead trees)

No serious damaging agent (Code 00)

Code	Cause of death	Code	Cause of death
10	Insects -- Unknown	20	Disease -- Unknown
11	Bark Beetles	21	White pine blister rust
12	Defoliators	22	Other rust cankers on main bole.
13	Balsam wooly aphid	23	Other conks on limb or ground near tree.
14	Sitka spruce weevil	24	Phellinus pini conks
15	Spruce budworm	25	Echinodontium tinctorium conks.
		26	Phaeolus schweinitzii conks.
		27	Other diseases and rot
		28	Root rot other than P.Weirii.
		29	Phellinus weirii
30	Fire damage	40	Animal damage
50	Weather -- Unknown	60	Suppression
51	Lightning	70	Other damage -- Unknown
52	Wind	71	Natural mechanical injury
53	Other	72	Top out, dead, or spike top
54	Erosion, mass movement	73	Forked top, multiple stem
		74	Deformed top above merchantable height
		75	Needles or leaves short, sparse, or off color.
		77	Excessive lean over 15 deg.
		81	Power equipment damage
		82	Other logging damge
		83	Other cultural damage
		84	Chemical damage
		91	Excessive deformity will not produce minimum log.

(2) Snag conditions for salvable dead and standing nonsalvable dead trees

92	Hard snag with cavities or den
93	Hard snag without cavities or den
94	Soft snag with cavities or den
95	Soft snag without cavities or den
96	Down salvable dead

APPENDIX - 8
DETERIORATION CHARACTERISTICS USEFUL IN POSTDATING TREE MORTALITY

Species	Trees dead less than 2 years	Trees dead 2 to 5 years	Trees dead more than 5 years
Douglas-fir			
Foliage	10 percent or more present	Less than 10 percent present	Absent
Twigs	75 percent or more present	10 to 75 percent present	Less than 10 percent present
Limbs	Intact	Some falling on small trees	Falling
Top	Intact	Some breakage in top ¼ of tree around 4th year	Top ½ broken on about 50 percent of trees
Bark	Intact	Some sloughing on small trees	Sloughing
Sapwood	Green to stained	Some sapwood deterioration	Considerable sap rot
Fungi	Fresh Polyporus volutinus[1]	Fomes pinicola on small trees[2]	F. pinicola and other conks common
Western hemlock			
Foliage	Less than 25 percent present	Little or none present	Absent
Twigs	Intact	20 percent or more present	Less than 20 percent present
Limbs	Intact	Some falling on small trees	Many falling
Bark	Intact	Loosening on small trees	Loose, sloughing
Sapwood	Stained - some rot	Considerable deterioration	Deterioration almost complete
Fungi	Fresh Polyporus volutinus[1]	Fomes pinicola others common	F. pinicola common
True firs			
Foliage	20 percent or more present	Less than 20 percent present	Absent
Twigs	65 percent or more present	5 to 65 percent present	Less than 5 percent present
Limbs	Intact	Considerable number falling	Many falling
Bark	Intact	Beginning to slough	Loose, sloughing
Sapwood	Green to rotting	Considerable rot	Deterioration complete
Fungi	Fresh Polyporus volutinus[1]	Fomes pinicola appearing	Miscellaneous species
Ponderosa pine			
Foliage	20 percent or more present	Less than 20 percent present	Absent
Twigs	Intact	30 percent or more present	Less than 30 percent present
Limbs	Intact	few falling	Many falling
Bark	Intact	Loosening	Loose, sloughing
Sapwood	Green to stained	Considerable deterioration	Deterioration severe
Fungi	Blue stain, Polyporus volutinus	P. volutinus drying up	Miscellaneous species

[1] Small, round, white sporophores on bole of tree (usually less than 1½-inch in diameter).

[2] F. pinicola conks are small and yellowish in color for first three years, and first appear in bark crevices. From 4th year on, they develop reddish margins and become large and bracket-shaped.

APPENDIX 8

(continued)

Species	Trees dead less than 2 years	Trees dead 2 to 5 years	Trees dead more than 5 years
Sugar pine			
Foliage	20 percent or more present	Less than 20 percent present	Absent
Twigs	Intact	30 percent or more present	Less than 30 percent present
Limbs	Intact	small ones falling	Many falling
Bark	Intact	Some loosening	Loose, sloughing
Sapwood	Green to stained	Considerable deterioration	Deterioration severe
Fungi	Blue stain, Polyporus volutinus	P. volutinus drying up	Miscellaneous species
Western redcedar			
Foliage	25 percent or more present	Less than 25 percent present	Absent
Twigs	Intact	60 percent or more present	Less than 60 percent present
Limbs	Intact	very few falling	Some falling
Bark	Intact	Intact	Large pieces stripping off
Sapwood	Green to gray	Sound	Sound
Fungi	Negligible	Little or none	Few

APPENDIX 9
TALLY GUIDES

OCC3 GLC	Condition Class Attributes	Subplot Attributes	Veg.Profile & Seedling Count	17-Meter Mapping Record	Tree tally
20,49	1-9 13-21	Sections I & II	YES	YES	Reference trees Site trees 3.3 m fixed-rad. Prism tally Snag tally CWD
44 on 11k grid (subplot center)	1-9 13-21	Sections I & II	YES	YES	Reference trees 3.3 m fixed radius Prism tally Snag tally CWD
20,49 44 on 11k grid (sliver)	1-9 13-24	NO	NO	YES	
20,49 44 on 11k grid (access-denied)	1-9 13-26	Sections I & II	NO	NO	
41-43, 45-48, 60s,92 44s not on 11k grid (entire subplot)	1-9*	Condition Class, Condition Class %	NO	NO	NO

* OCC2 data items not required if plot is new-to-inventory

CONDITION CLASS 1 on Remeasured (##) (11-55).
CONDITION CLASS 1 on Remeasured/moved (R#) (R1-R5).

LINE#	PT	TH	SPP	AZM	DIST	TRN	INC	DBH2	DBH3	HT2	HT3	BH AGE	C/R	C/C	GI	UU DD HV	M	L	CO	R	D C
1. Live tree,tallied at OC2 dbh 2.5 - <12.5 at OC2 & OC3																					
XXXXX	XX	11	XXX	XXX	XXXX	---	---	DDDD	XXXX	XXX	XXX	XXX	X	X	X	XX	--	X	H	--	- -
2. Live tree,tallied at OC2, dbh 2.5 - <12.5 at OC2, >12.4 dbh at OC3																					
XXXXX	XX	11	XXX	XXX	XXXX	XXX	---	DDDD	XXXX	XXX	XXX	XXX	X	X	X	XX	--	X	H	XX	X -
3. Live tree,tallied at OC2, OC2 dbh >12.4,OC2 ht meas,normal, 1st of spc on plot																					
XXXXX	XX	11	XXX	XXX	XXXX	XXX	---	XXXX	XXXX	MMM	MMM	XXX	X	X	X	XX	--	X	H	XX	X -
4. Live tree,tallied at OC2, OC2 dbh >12.4, OC2 ht recorded																					
XXXXX	XX	11	XXX	XXX	XXXX	XXX	---	XXXX	XXXX	XXX	---	XXX	X	X	X	XX	--	X	H	XX	X -
5. Live tree,tallied at OC2, OC2 dbh >12.4 no ht recorded OC2																					
XXXXX	XX	11	XXX	XXX	XXXX	XXX	---	XXXX	XXXX	---	XXX	XXX	X	X	X	XX	--	X	H	XX	X -
6. Live tree,tallied at OC2, OC3 dbh >12.4, dbh est or double nail first time OC3																					
XXXXX	XX	11	XXX	XXX	XXXX	XXX	CCC	BBBB	EEEE	---	XXX	XXX	X	X	X	XX	--	X	H	XX	X -
7. Live conifer,not tallied at OC2, OC3 dbh >17.4 not on 3.3m fixed radius																					
XXXXX	XX	12	XXX	XXX	XXXX	XXX	XXX	BBBB	XXXX	---	XXX	XXX	R	X	R	X	XX	--	X	-	XX X -
8. Live hardwood,not tallied at OC2, OC3 >17.4, not on 3.3m fixed radius																					
XXXXX	XX	12	XXX	XXX	XXXX	XXX	---	----	XXXX	---	XXX	XXX	R	X	R	X	XX	--	X	X	XX X -
9. Killed tree, tallied as live at OC2, OC2 dbh <12.5, in NE Quad at OC2																					
XXXXX	XX	13	XXX	XXX	XXXX	---	---	XXXX	----	XXX	---	XXX	X	-	X	-	XX	--	C	H	-- - -
10. Killed tree, tallied as live at OC2 OC2 dbh >12.4																					
XXXXX	XX	13	XXX	XXX	XXXX	XXX	---	XXXX	----	???	---	XXX	X	-	X	-	XX	--	C	H	?? ? -
11. Live tree on 3.3m fixed radius at OC3, not live or dbh <2.5 at OC2, dbh <12.5 at OC3																					
XXXXX	XX	14	XXX	XXX	XXXX	---	---	----	XXXX	---	XXX	XXX	-	X	-	X	XX	--	X	H	-- - -

* Bored age required if conifer
H Record clump for hardwoods only
MMM Measured ht
CCC Bore conifers for increment
BBBB OC2 dbh calculated for conifers by computer from bored inc
EEEE Dbh estimated or double nail for first time at OC3
??? Height, cull other, and cull rot on killed, dead and stumps only if recorded at OCC2.
C OC2 mistletoe on killed, dead and stumps for conifers only
R Reconstruct OC2 crown ratio and crown class
DDDD Delete OCC 2 dbh if rounded to the nearest 50 mm.

CONDITION CLASS 1 on Remeasured (##) (11-55).
CONDITION CLASS 1 on Remeasured/moved (R#) R1-R5).

```
                                                   BH             UU   C    C D
LINE# PT TH SPP AZM DIST TRN INC DBH2 DBH3 HT2 HT3 AGE C/R C/C GI DD M L CO R C
                                                                  HV
```

12. Live tree on 3.3m fixed radius at OC3, not live or dbh <2.5 at OC2, dbh >12.4 at OC3
```
XXXXX XX 14 XXX XXX XXXX XXX --- ---- XXXX --- XXX XXX*- X - X XX -- X H XX X -
```

13. Dead tree, tallied as live <12.5 dbh at OC2 in NE Quad at OC2
```
XXXXX XX 15 XXX XXX XXXX --- --- XXXX ---- XXX --- XXX X - X - XX XX C H -- - -
```

14. Dead tree, tallied as live >12.4 dbh at OC2
```
XXXXX XX 15 XXX XXX XXXX XXX --- XXXX ---- ??? --- XXX X - X - XX XX C H ?? ? -
```

15. Live tree, dbh 2.5 - <12.5 on 3.3m fixed radius OC2, not tallied OC2, OC3 dbh <12.5
```
XXXXX XX 16 XXX XXX XXXX --- --- ---- XXXX --- XXX XXX R X R X XX -- X H -- - -
```

16. Live tree, dbh 2.5 - <12.5 on 3.3m fixed OC2 not tallied OC2, OC3 dbh >12.4
```
XXXXX XX 16 XXX XXX XXXX XXX CCC BBBB XXXX --- XXX XXX R X R X XX -- X H XX X -
```

17. Live tree, >12.4 dbh at OC2, missed at OC2
```
XXXXX XX 16 XXX XXX XXXX XXX CCC BBBB XXXX --- XXX XXX R X R X XX -- X H XX X -
```

18. Snag, dbh >22.4, tallied as live tree OC2, line # matched OC2 line #
```
XXXXX XX 17 XXX XXX XXXX --- --- ---- XXXX --- XXX --- - - - - -- XX - - -- - X
```

19. Snag at OC2 and OC3, dbh >22.4 OC2 & OC3 ht 2+m OC2 & OC3
```
XXXXX XX 17 XXX XXX XXXX --- --- XXXX XXXX XXX XXX --- - - - - XX XX - - -- - X
```

20. Snag at OC2, gone at OC3
```
XXXXX XX 17 XXX XXX XXXX --- --- XXXX ---- XXX --- --- - - - - XX XX - - -- - -
```

21. Harvested tree, at OC3, tallied as live tree at OC2, dbh >12.4 at OC2
```
XXXXX XX 18 XXX XXX XXXX XXX --- XXXX ---- ??? --- XXX X - X - XX XX C H ?? ? -
```

22. Reference tree only:
```
XXXXX XX 19 XXX XXX XXXX --- --- ---- XXXX --- --- --- - - - - -- -- - - -- - -
```

23. Subplot with no TH 1-6 tally
```
XXXXX XX 10 --- --- ---- --- --- ---- ---- --- --- --- - - - - -- -- - - -- - -
```

C   Mistletoe on killed, dead and stumps for conifers only
??? Height, cull other and cull rot on killed, dead and stumps only if recorded at OC2
CCC Bored inc on conifers
BBBB OC2 dbh calculated for conifers by computer from bored inc;
R   Reconstruct OC2 crown ratio and crown class
*   Count the whorls on a conifer less than 14.0 cm dbh.

CONDITION CLASS 1 on C# (C1-C5)
CONDITION CLASS 1 on N# (N1-N5) which is not associated with an R# and not in a clearcut

```
                                                                BH              UU   C     C D
LINE# PT TH SPP AZM DIST TRN INC DBH2 DBH3 HT2 HT3 AGE C/R C/C GI DD M L CO R C
                                HV
```

1. Live tree dbh > 12.4 at OC3 live at OC2, bored for inc if conifer
```
XXXXX XX 12 XXX XXX XXXX XXX CCC BBBB XXXX --- XXX XXX R X R X XX -- X H XX X -
```

2. Live tree dbh 2.5 - <12.5 live at OC2
```
XXXXX XX 12 XXX XXX XXXX XXX --- ---- XXXX --- XXX XXX R X R X XX -- X H -- - -
```

3. Killed tree, live at OC2, OC2 dbh <12.5, in NE Quad at OC2
```
XXXXX XX 13 XXX XXX ---- --- --- XXXX ---- XXX --- XXX R - R - XX -- C H -- - -
```

4. Killed tree, live at OC2, OC2 dbh >12.4
```
XXXXX XX 13 XXX XXX XXXX XXX --- XXXX ---- --- --- XXX R - R - XX -- C H -- - -
```

5. Live tree on 3.3m fixed radius at OC3, not live or dbh <2.5 at OC2, dbh <12.5 at OC3
```
XXXXX XX 14 XXX XXX XXXX --- --- ---- XXXX --- XXX XXX - X - X XX -- X H -- - -
```

6. Live tree on 3.3m fixed radius at OC3, not live or dbh <2.5 at OC2, dbh >12.4 at OC3
```
XXXXX XX 14 XXX XXX XXXX XXX --- ---- XXXX --- XXX XXX*- X - X XX -- X H XX X -
```

7. Dead tree, live <12.5 dbh at OC2, in NE Quad at OC2
```
XXXXX XX 15 XXX XXX XXXX --- --- XXXX ---- XXX --- XXX R - R - XX XX C H -- - -
```

8. Dead tree, live >12.4 dbh at OC2
```
XXXXX XX 15 XXX XXX XXXX XXX --- XXXX ---- --- --- XXX R - R - XX XX C H -- - -
```

9. Snag, dbh >22.4, live "in" tree at OC2 -(Husky will ask "Is this a mortality")
```
XXXXX XX 17 XXX XXX XXXX --- --- ---- XXXX --- XXX --- - - - - -- XX - - -- - X
```

10. Snag at OC2 and OC3, dbh >22.4 OC2 & OC3 ht 2+m OC2 & OC3
```
XXXXX XX 17 XXX XXX XXXX --- --- XXXX XXXX XXX XXX --- - - - - XX XX - - -- - X
```

11. Harvested tree, at OC3, live tree at OC2, dbh >12.4 at OC2
```
XXXXX XX 18 XXX XXX XXXX XXX --- XXXX ---- --- --- XXX X - X - XX XX C H -- - -
```

12. Reference tree only:
```
XXXXX XX 19 XXX XXX XXXX --- --- ---- XXXX --- --- --- - - - - -- -- - - -- - -
```

13. Subplot with no TH 1-6 tally
```
XXXXX XX 10 --- --- ---- --- --- ---- ---- --- --- --- - - - - -- -- - - -- - -
```

C Mistletoe on killed, dead and stumps for conifers only
CCC Bored inc on conifers
BBBB OC2 dbh calculated for conifers by computer from bored inc;
R Reconstruct OC2 crown ratio and crown class
* Bore for age if conifer

CONDITION CLASS 2-5.
CONDITION CLASS 1 on N# which is associated with an R#
CONDITION CLASS 1 on N# which is not associated with an R# but is in a clearcut

```
                                                                BH              UU   C    C D
LINE# PT TH SPP AZM DIST TRN INC DBH2 DBH3 HT2 HT3 AGE C/R C/C GI DD M L CO R C
                            HV
1. Live tree dbh >12.4
XXXXX XX @2 XXX XXX XXXX XXX --- ---- XXXX --- XXX XXX - X - X XX -- X H XX X -

2. Live tree dbh <12.5
XXXXX XX @2 XXX XXX XXXX XXX --- ---- XXXX --- XXX XXX - X - X XX -- X H -- - -

3. Snag, dbh >22.4
XXXXX XX @7 XXX XXX XXXX --- --- ---- XXXX --- XXX --- - - - - -- XX - - -- - X

4. Reference tree only:
XXXXX XX @9 XXX XXX XXXX --- --- ---- XXXX --- --- --- - - - - -- -- - - -- - -

5. Subplot with no TH 1-6 tally
XXXXX XX @0 --- --- ---- --- --- ---- ---- --- --- --- - - - - -- -- - - -- - -
```

@ condition class

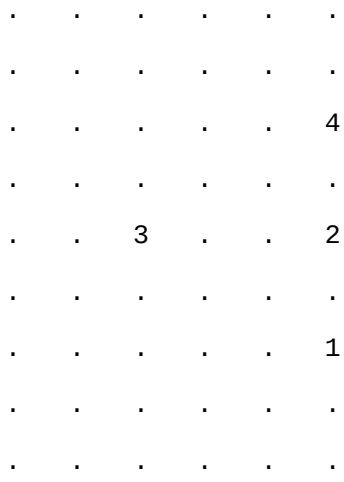
1991-1994 CALIFORNIA FOREST INVENTORY PLOT RECORD

COUNTY NAME _____ PLOT _____ DATE _____

ESTIMATOR _____ RECORDER _____ HUSKY ID # _____

PLOT LAYOUT:

RP: SPECIES ____ DBH _____CM AZ ____ SLOPE DISTANCE _____M



LOCATION DESCRIPTION_____

PRESENT CONDITION/PAST DISTURBANCE_____

PT LOCATION:

PT	PT	AZ	DIST(m)
1	2	360	43
2	3	270	64
2	4	360	64
2	5	90	64
5	2	270	64
3	4	45	90.5
4	5	135	90.5

INTERACTIVE ITEMS: (O = OFFICE F = FIELD)

O - FIELD CHECK ITEM _____

F - CONTACT OFFICE ABOUT _____

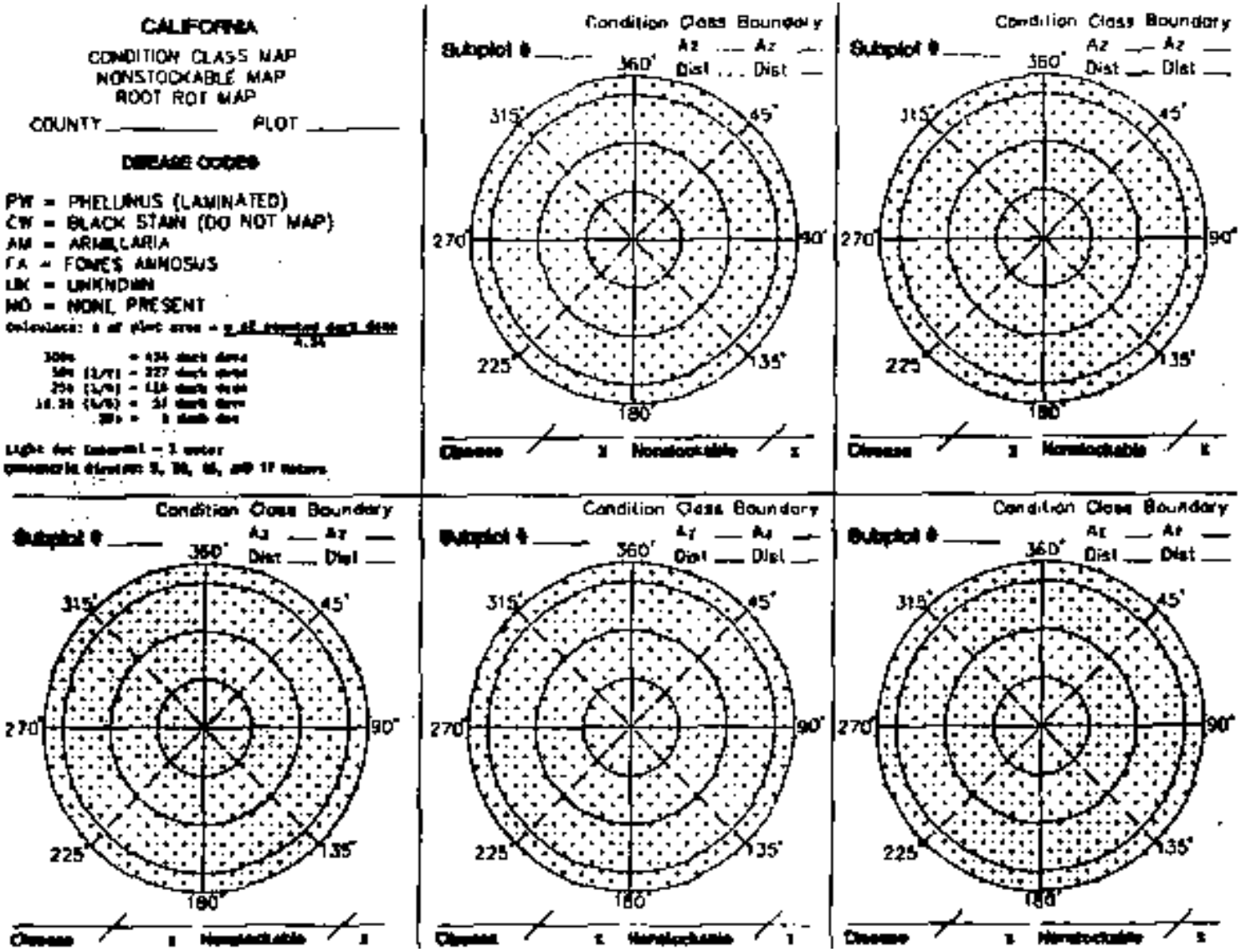
O - OWNER RESPONSE: YES (check enclosed card) NO (check owner list)

F - DOES CURRENT OWNER DIFFER FROM OCC 2 OWNER CLASS? ___ IF YES, DATE OF CHANGE _____

F - IS DATE OF DISTURBANCE SINCE OCC 2 CONFIRMED? ____

F - REMEASURED PLOTS ONLY: IS CONDITION CLASS 1 OCC 2 GLC UPDATED?____ IF YES, EXPLAIN

_____


CALIFORNIA
CONDITION CLASS MAP
NONSTOCKABLE MAP
ROOT ROT MAP
COUNTY _____ PLOT _____
DISEASE CODES
PW = PHELLINUS (LAMINATED)
CW = BLACK STAIN (DO NOT MAP)
AM = ARMILLARIA
FA = FOMES ANNOSUS
UK = UNKNOWN
NO = NONE PRESENT
Condition Class Boundary
Subplot # _____
Az ___ Az ___
Dist ___ Dist ___
360°
45°
90°
135°
180°
225°
270°
315°
Disease ___ % Nonstockable ___ %

CALIFORNIA FOREST INVENTORY PLOT ATTRIBUTE RECORD

COUNTY .... (...) PLOT ... MAP ...... PNT# ... PHOTO# .... T/R,S/40 ... ...

---AREA IDENTIFICATION--- -----CONDITION CLASS----

	1	2	3	4	5
1 COUNTY	...				
2 PLOT	...				
3 SAMPLE KIND	.	.	.	.	.
4 OWNER CLASS	..	...	...	...	...
5 OCC3 INV DATE	....				
6 OCC2 INV DATE	....				
7 OCC3 GND LAND CLASS	..	..	..	..	..
8 1lK GRID	.				
9 OCC2 GND LAND CLASS	..	..	..	..	..
10 OCC2 PI	..				
----- AREA CLASSIFICATION-----					
11 PRECIPITATION (CM)	...				
12 ELEVATION (DM)	....				
13 ASPECT	..				
14 SLOPE	..	..	..	..	..
15 SOIL DEPTH	.	.	.	.	.
16 KIND DISTURB SINCE OCC3	.	.	.	.	.
17 KIND DISTURB BEFORE OCC2	.	.	.	.	.
18 DATE DISTURB SINCE OCC2	..	..	..	..	..
19 DATE DISTURB BEFORE OCC2	..	..	..	..	..
20 SILV TEEAT SINCE OCC2	..	..	..	..	..
21 MIXED CONIFER SITE	.	.	.	.	.
22 STAND AGE (FOR SLIVERS)	..	..	..	..	..
23 FORSST TYPE (FOR SLIVERS)	...	...	...	...	...
24 STAND SIZE (FOR SLIVERS)	.	.	.	.	.
FOR ACCESS DENIED PLOTS:					
25 OCCZ % CROWN CLOSURE	..	..	..	..	..
26 OCC3 % CROWN CLOSURE	..	..	..	..	..
27 PLANT INDICATOR SET #	.	.	.	.	.

---------------SITE INDEX DATA------------

#	SUB PLT #	AZ	SP	DBH	HT	RHT	BH AGE	OCC REC	SI
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CALIFORNIA FOREST INVENTORY SUBPLOT RECORD

COUNTY ..... (...) PLOT ... DATE ...

I. SUBPLOT NUMBER	.1	.2	.3	.4	.5
CONDITION CLASS	.	.	.	.	.
ASPECT	..	..	..	..	..
SLOPE	..	..	..	..	..
TOPO POSITION	.	.	.	.	.
STREAM CLASS	.	.	.	.	.
STREAM PROXIMITY	..	..	..	..	..

II. SITE IMPACTORS(17M)	%	%	%	%	%
NONSTOCKABLE CONDITION	0	0	0	0	0
ROOT DISEASE ..	..	..	..	..	..
..	..	..	..	..	..
..	..	..	..	..	..
CONDITION CLASS: 1	..	..	..	..	..
CONDITION CLASS: 1	..	..	..	..	..
CONDITION CLASS: 1	..	..	..	..	..
CONDITION CLASS: 1	..	..	..	..	..
CONDITION CLASS: 1	..	..	..	..	..

III.SEEDLING COUNT(3.3M) ---SPECIES---		--SUBPLOT NO-- .1 .2 .3 .4 .5
YEW SPROUT	230	.. ..
YEW SEEDLING	231	.. ..
	...	.. ..
	...	.. ..
	...	.. ..
	...	.. ..
	...	.. ..
	...	.. ..
	...	.. ..
	...	.. ..

IV. HEIGHTS OF CANOPY LAYERS		
	LAYER	HGT(DM)
SEEDLINGS	1	...
	2	...
SHRUBS	1	...
	2	...
HERBS	1	...
	2	...

```
CALIFORNIA FOREST INVENTORY VEGETATION PROFILE RECORD

COUNTY  .............. (...)   PLOT  ...    DATE  ....
__________________________________________________________________
V. VEGETATION PROFILE (5M)
       SUBPLOT NUMBER                .1     .2     .3     .4     .5
                                 ----------PERCENT COVER----------
    OC2    OC3         STG OC3  OC OC  OC OC  OC OC  OC OC  OC OC
    SPP    SPP         DEV LAY   2  3   2  3   2  3   2  3   2  3
                ALL SHRUBS           ..     ..     ..     ..     ..
                ALL HERBS            ..     ..     ..     ..     ..
% VEG PROF IN CC OF SP CENTER        ..     ..     ..     ..     ..
TREES:   ......             .        ..     ..     ..     ..     ..
         ......             .        ..     ..     ..     ..     ..
         ......             .        ..     ..     ..     ..     ..
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SHRUBS:
  ...... ......          .  .   .. ..  .. ..  .. ..  .. ..  .. ..
  ...... ......          .  .   .. ..  .. ..  .. ..  .. ..  .. ..
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HERBS:
  ...... ......          .  .   .. ..  .. ..  .. ..  .. ..  .. ..
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  ...... ......          .  .   .. ..  .. ..  .. ..  .. ..  .. ..
```

```
CALIFORNIA                                 M  J  J  A  S  O  N
                               FOREST INVENTORY TREE TALLY                        #RNG  9 10 10 10 10 10 10

COUNTY ..............  (...)            PLOT ...                                     PAGE  ..
                              OC3  OC2  OC3 OC2 OC3 BH              D/
 LINE PT TH SPC AZM DIST TRN INC  DBH  DBH  HT  HT AGE  C/R C/C GI  U M CL CO CR DC
    1  2  3   4   5    6   7   8    9   10  11  12  13 14151617 18 1920 21 22 23 24      REMARKS

                                                                                  ...........................
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COARSE WOODY DEBRIS TALLY SHEET

COUNTY # ________ PLOT #_______ PAGE:______

PT	TI	LINE DIST	CWD DIST	SPC	TRNST DIAM	SML DIAM	LRG DIAM	LENGTH	DECAY CLASS	CONT	ORNT	HOL?
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APPENDIX 10

RESIDUE PILE TALLY SHEET

COUNTY #_______ PLOT #_______ PAGE:_____

PT	AZ	SHAPE	LENGTH1	LENGTH2	WIDTH1	WIDTH2	HEIGHT2	HEIGHT2	PROP.	REMARKS
..	...	.	...	...	...	...	...	...	...	
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APPENDIX 10
SAMPLE PLOT RECORDS

PLANT INDICATORS

COUNTY # _____ PLOT # _____ PAGE: _____

SET 1		SET 2	
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
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APPENDIX 11

HELPFUL HINTS

Condition Class

.4 Hectares (Land Class) = 4,000 sq meters = 40 meters x 100 meters

2.5 Hectares (Stand Condition) = 25,000 sq meters = 100 meters x 250 meters

Vegetation Profile

The vegetation profile is done on a 5 meter radius circle
If 100% of the circle is in one condition class:

3% cover means a circle with a .9 meter radius
5% cover means a circle with a 1.1 meter radius
10% cover means a circle with a 1.6 meter radius
20% cover means a circle with a 2.2 meter radius

Metric System for Length

The metric system is a standard of length which uses numbers in a factor of ten. The system is based on one unit of length: the meter.

1000 millimeters (mm) = 1 meter
100 centimeters (cm) = 1 meter
10 decimeters (dm) = 1 meter
1 meter (m) = 1 meter

seen in another way:

.001 meters = 1 millimeter
.01 meters = 1 centimeter
.1 meters = 1 decimeter
1 meter = 1 meter
10 meters = 1 decameter
100 meters = 1 hectometer
1000 meters = 1 kilometer

Photograph Scales

Scale	Length on Photo	Length on Ground
1:15,840	1 mm	15.8 meters
1:24,000	1 mm	24.0 meters
1:31,680	1 mm	31.7 meters

GLOSSARY

ACRE: A PARCEL OF LAND CONTAINING 43,560 SQUARE FEET OF AREA. 0.4 HECTARE.

AGE, BREAST-HIGH THE NUMBER OF ANNUAL GROWTH RINGS BETWEEN THE BARK AND THE CENTER OF THE TREE, AS COUNTED AT 1.37 METERS.

AZIMUTH: ANGLE OR DIRECTION FROM 1 TO 360 DEGREES. THE AZIMUTH PLUS 180 DEGREES IS THE BACK AZIMUTH.

BASAL AREA: (A) OF A TREE, THE CROSS SECTIONAL AREA OF A TREE AT BREAST HEIGHT ON THE STEM. (B) OF A FOREST OR STAND, THE CROSS-SECTIONAL AREA AT BREAST HEIGHT OF ALL TREES WITHIN A UNIT OF AREA.

BASAL AREA FACTOR (BAF): THE BASAL AREA PER UNIT OF AREA CORRESPONDING WITH A GIVEN CRITICAL ANGLE IN VARIABLE-RADIUS PLOT SAMPLING. THE BAF MULTIPLIED BY THE NUMBER OF TREES SAMPLED USING THE BAF EQUALS STAND BASAL AREA PER UNIT OF AREA.

BOLE: TRUNK OR MAIN STEM OF A TREE.

BORDERLINE TREE: A TREE THAT IS AT OR NEARLY AT THE LIMITING DISTANCE ASSOCIATED WITH A GIVEN BASAL AREA FACTOR. BORDERLINE TREES REQUIRED PRECISE CHECKING TO DETERMINE IF THEY ARE TO BE SAMPLED.

BREAST HEIGHT: THE STANDARD HEIGHT--1.37 METERS ABOVE GROUND LEVEL--AT WHICH DIAMETER OF A STANDING TREE IS MEASURED. ON SLOPING GROUND, BREAST HEIGHT IS MEASURED ON THE UPHILL SIDE OF THE TREE.

CAMBIUM: THE LAYER OF CELLS (IN A TREE) BETWEEN THE WOOD AND BARK.

CANKER: LOCALIZED INJURY TO STEM, BRANCH OR ROOT; CAUSED BY DISEASE OR INSECTS.

CANOPY: THE COVER OF BRANCHES AND FOLIAGE FORMED BY TREE CROWNS.

CENSUS WATER: AREAS OF WATER MORE THAN 16 HECTARES (40 ACRES) OR WIDER THAN 200 METERS.

CHAIN: A CHAIN EQUALS 66 FEET OR 20 METERS.

CONIFER:	CONE-BEARING TREES, MOSTLY EVERGREENS, WITH NEEDLE OR SCALE-LIKE LEAVES BELONGING TO THE BOTANICAL GROUP GYMNOSPERMAE. ALSO REFERRED TO AS SOFTWOODS.
CONK:	THE FRUITING BODY OF A WOOD-DESTROYING FUNGUS WHICH PROJECTS FROM THE TRUNK, ROOTS OR OTHER TREE PARTS.
CREW SUPERVISOR:	NUMBER 1 BOSS PERSON.
CROOK:	ABRUPT BEND OR CURVATURE IN A STEM; A DEFECT IN TIMBER AND PERSONS.
CROWN:	THE PORTION OF A TREE CARRYING THE MAIN BRANCH SYSTEM AND FOLIAGE.
CROWN CLASS:	THE SOCIAL POSITION OF A TREE RELATIVE TO ITS ABILITY TO RECEIVE DIRECT SUNLIGHT.
CROWN RATIO:	THE PERCENT OF THE TOTAL HEIGHT OF THE TREE WHICH SUPPORTS LIVE CROWN.
CULL:	(A) TREES OR LOGS OR PORTIONS OF LOGS THAT ARE OF MERCHANTABLE SIZE BUT ARE UNUSABLE FOR INDUSTRIAL WOOD PRODUCTS DUE TO DEFECTS (ROT OR FORM). (B) TO REJECT A LOG OR PORTION OF A LOG IN RESPECT TO GROSS VOLUME (C) THE DEDUCTION MADE FROM GROSS VOLUME OF A LOG TO ADJUST FOR DEFECT.
CULL OTHER:	PERCENTAGE DEDUCTION OF VOLUME LOST DUE TO BROKEN OR MISSING PARTS, FORKS OR CROOKS.
CULL ROT:	ASSESSMENT OF TREE ROT, AS VISUALLY INDICATED BY CONKS, ROTTEN SEAMS, ETC., CODED AS A CATEGORY OF PERCENTAGE OF VOLUME AFFECTED BY THE ROT.
DBH:	DIAMETER BREAST HEIGHT: THE TREE DIAMETER MEASURED AT BREAST HEIGHT--1.37 METERS ABOVE GROUND LEVEL.
DEFOLIATOR:	AN ORGANISM, USUALLY AN INSECT, WHICH FEEDS UPON, DAMAGES, OR STRIPS LEAVES AND NEEDLES FROM TREES.
EVEN-AGED STAND:	A STAND IN WHICH INDIVIDUAL TREES ORIGINATED AT APPROXIMATELY THE SAME TIME. THE AGES OF TREES IN MATURE EVEN-AGED STANDS ARE SELDOM DIFFER BY MORE THAN 30 YEARS.
FIELD GRID LOCATION	THE CENTER OF SUBPLOT 1 ON WHICH CONDITION CLASS 1 IS BASED. THE FIELD GRID LOCATION IS THE PINPRICKED LOCATION OF THE OCC 2 POINT 1 (CEDAR STAKED) ON REMEASURED LOCATION PLOTS.

FIELD GRID LOCATION CONT'D	ON PLOTS MISSING OR LOST SINCE OCC 2, THE FIELD GRID LOCATION IS THE PINPRICKED LOCATION ON THE OCC 2 PHOTOS. FOR PLOTS NEW TO THE INVENTORY AT OCC 3, THE FIELD GRID LOCATION IS THE PINPRICKED LOCATION ON THE OCC 3 PHOTOS.
FIXED-RADIUS PLOT:	A CIRCULAR SAMPLED AREA WITH A SPECIFIED RADIUS. WITHIN THE SAMPLED AREA, ALL TREES OF A GIVEN SIZE, SHRUBS, OR OTHER ITEMS ARE TALLIED.
FORAGE:	EDIBLE VEGETATION FOR WILDLIFE/LIVESTOCK.
FORB:	A BROAD-LEAVED HERBACEOUS PLANT AS DISTINGUISHED FROM GRASSES, SHRUBS AND TREES.
GALL, LEAF:	A TUMOR (ABNORMAL PROLIFERATION OF PLANT TISSUE) ON LEAVES CAUSED BY INSECTS OR DISEASE.
GLC:	GROUND LAND CLASS. SEE PAGES 83-86.
HARDWOODS:	BROAD-LEAVED AND DECIDUOUS TREES AS OPPOSED TO HAVING NEEDLES. TREES BELONGING TO THE BOTANICAL GROUP ANGIOSPERMAE.
HEARTWOOD:	THE INNER, NONLIVING CORE OF WOOD IN A TREE, GENERALLY DARKER THAN SAPWOOD.
HECTARE:	A METRIC UNIT OF LAND MEASURE EQUAL TO 10,000 SQUARE METERS. 2.47 ACRES.
INGROWTH:	TREES THAT HAVE GROWN PAST A MINIMUM SIZE THRESHOLD ON A FIXED-RADIUS PLOT SINCE PREVIOUS INVENTORY. TREES NOT PRESENT AT OCC2 THAT ARE ALIVE AT OCCASION 3 AND GREATER THAN 2.5 CM DBH ON THE 3.3 METER FIXED-RADIUS PLOT.
LIMITING DISTANCE:	THE SET OF DISTANCES FOR A SPECIFIED BASAL AREA FACTOR WHICH DETERMINES WHETHER A TREE IS IN OR OUT OF THE SAMPLE. THE DISTANCE IS THE PRODUCT OF THE TREE'S DBH MULTIPLIED BY THE PLOT RADIUS FACTOR. THE PLOT RADIUS FACTOR IN CALIFORNIA IT IS 0.1889.
MAI:	MEAN ANNUAL INCREMENT. MAI IS THE AVERAGE ANNUAL GROWTH OF A STAND AT THE CULMINATION OF MEAN ANNUAL INCREMENT.

MYCELIUM:	THE VEGETATIVE PART OF A FUNGUS; A MASS OF THREAD-LIKE FILAMENTS.
NONFOREST INCLUSION:	AN AREA THAT IS NONFOREST, BUT LESS THAN 0.4 HECTARE IN SIZE. WHEN PART OR ALL OF A FIXED OR VARIABLE-RADIUS PLOT FALLS WITHIN A NONFOREST INCLUSION, THE INCLUSION IS SAMPLED LIKE THE SURROUNDING FOREST LAND.
NONSTOCKABLE:	AREA OF FOREST LAND NOT CAPABLE OF SUPPORTING TREES DUE TO PRESENCE OF ROCKY CONDITIONS, STANDING WATER, UNIMPROVED ROADS, MASS SOIL SLUMPS, ETC.
OCC 1:	THE INVENTORY OF 1965-72.
OCC 2:	THE INVENTORY OF 1981-84
OCC 3:	THE CURRENT INVENTORY.
PC:	PLOT CENTER. THE FIELD GRID LOCATION ON THE GROUND FOR EACH FIELD PLOT. ON REMEASUREMENT PLOTS, PLOT CENTER IS AT THE OCC 2 CEDAR STAKE. ON MISSING OR LOST PLOTS, PLOT CENTER IS THE PINPRICKED LOCATION ON THE OCC 2 PHOTOS. ON NEW PLOTS, PLOT CENTER IS THE PINPRICKED LOCATION ON THE OCC 3 PHOTOS.
PI:	PHOTO INTERPRETATION.
PIECE OF CAKE:	PLOT THAT IS FLAT, NON-BRUSHY, NEAR A ROAD, WITH ENOUGH TREES FOR SHADE BUT NOT MORE THAN 2 PER POINT. WEATHER ON DAY THAT THE PLOT IS DONE IS SUNNY WITH HIGHS IN THE MID-60S. OWNER IS CONGENIAL AND HAS MAD DOGS ON SHORT CHAINS.
POLETIMBER:	A TREE 12.5 TO 22.4 CM DBH.
PLANT INDICATOR	A PLANT SPECIES USED IN REGRESSION EQUATIONS TO PREDICT AN AREA'S STOCKING CAPACITY.
RANGELAND:	LAND ON WHICH THE NATURAL PLANT COVER IS COMPOSED PRINCIPALLY OF NATIVE GRASSES, FORBS, OR SHRUBS VALUABLE FOR FORAGE.
REAL BEAR:	THE KIND OF PLOT YOU HOPE THE OTHER CREW GETS.
REGENERATION:	THE RENEWAL OF A TREE CROP, WHETHER BY NATURAL OR ARTIFICIAL MEANS. A YOUNG, PRECOMMERCIAL-SIZED STAND.
RELEASE:	FREEING A TREE FROM IMMEDIATE COMPETITION BY REMOVING OTHER TREES OR NONTREE COMPETITION

RESIDUAL:	A TREE LEFT OVER FROM THE REMOVAL OF THE PREVIOUS STAND.
ROT:	DECAY. DECOMPOSITION OF WOOD BY FUNGI OR BACTERIA.
ROUNDWOOD:	SECTIONS OF TREE STEMS, WITH OR WITHOUT BARK. INCLUDES LOGS, BOLTS, POSTS, PILINGS AND OTHER PRODUCTS STILL "IN THE ROUND".
RP:	REFERENCE POINT. AN OBJECT (USUALLY A TREE) WHICH CAN BE LOCATED ON THE GROUND AND IDENTIFIED ON THE PHOTO. IT WILL BE TAGGED AND REFERENCED TO PLOT LOCATION FOR RELOCATION ON FUTURE INVENTORIES.
SAPLING:	A TREE 2.5 TO 12.4 CM DBH.
SAPWOOD:	THE OUTER LAYERS OF WOOD BETWEEN THE HEARTWOOD AND INNER BARK. GENERALLY LIGHTER IN COLOR THAN HEARTWOOD.
SEEDLING:	A TREE LESS THAN 2.5 CM DBH THAT IS AT LEAST 15 CM IN HEIGHT AND ESTABLISHED IN MINERAL SOIL. INCLUDES TREES WITH A HEIGHT LESS THAN 1.37 METERS.
SILVICULTURE:	THE SCIENCE AND PRACTICE OF GROWING AND TENDING FOREST CROPS FOR SPECIFIED OBJECTIVES.
SITE:	THE AGGREGATE OF ALL ENVIRONMENTAL CONDITIONS AFFECTING THE SURVIVAL AND GROWTH OF A PLANT COMMUNITY.
SITE CLASS:	A CLASSIFICATION OF FOREST LAND IN TERMS OF PRODUCTIVITY POTENTIAL TO GROW CROPS OF INDUSTRIAL WOOD.
SITE INDEX:	A MEASURE OF PRODUCTIVITY BASED UPON THE HEIGHT OF DOMINANT AND CODOMINANT TREES AT A GIVEN BASE AGE.
SNAG:	A STANDING DEAD TREE. IN THE CURRENT INVENTORY A SNAG MUST BE AT LEAST 22.5 CM DBH AND AT LEAST 2 METERS TALL TO BE TALLIED AND LEANING LESS THAN 45 DEGREES..
SOFTWOODS:	CONIFEROUS TREES, USUALLY EVERGREEN, HAVING NEEDLE OR SCALE-LIKE LEAVES.
STAND DENSITY INDEX:	INDICATES THE NUMBER OF 10-INCH TREES NEEDED TO FULLY OCCUPY A SITE.

STOCKABILITY PROBLEM:	AN AREA NOT CAPABLE OF SUPPORTING THE TREE DENSITY OF THE STANDS USED BY RESEARCHERS IN CREATING NORMAL YIELD TABLES.
STOCKING:	AN EXPRESSION OF DENSITY THAT COMPARES THE NUMBER OF EXISTING TREES TO THE NUMBER IN A NORMAL STAND AS REPORTED IN NORMAL YEILD TABLES.
SUNSCALD:	CAMBIUM DAMAGE TO THIN-BARKED STEM CAUSED BY OVEREXPOSURE TO SUN.
SWEEP:	CURVE IN A STEM OR LOG WHICH DIFFERS FROM AN ABRUPT BEND. A TIMBER DEFECT.
TERMINAL LEADER:	THE TOPMOST SHOOT OF A TREE. OR: A CREW SUPERVISOR WITH AN INCURABLE AND FATAL DISEASE.
TRACHEID:	PART OF WOOD STRUCTURE: A LONG, TUBELIKE CELL IN WOOD TISSUE.
TRACKABLE TREES:	SAMPLED TREES THAT ARE REFERENCED AND REMEASURED IN SUCCESSIVE INVENTORIES ON PERMANENT PLOTS.
VARIABLE-RADIUS PLOT:	A PLOT ON WHICH TREES ARE SELECTED FOR MEASUREMENT ACCORDING TO SIZE RATHER THAN BY THE FREQUENCY OF THEIR OCCURRENCE. THE LARGER THE DIAMETER OF A TREE THE FARTHER FROM PLOT CENTER IT CAN BE AND STILL BE SAMPLED. HENCE, THE CONCEPT OF VARIABLE-RADIUS PLOT.
WILT:	DROOPING OF FOLIAGE; OFTEN A DISEASE SYMPTOM. ALSO, A CONDITION AMONG FORESTRY PERSONNEL THAT IS ALL TOO COMMON AFTER AGE 40.